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THE CHALLENGE OF THE FALLING BIRTH RATE*

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THE challenge of the falling birth rate is not an idle phrase designed to catch the eye or ear, but the expression of a reality which is, whether we realize it or not, exerting a profound influence upon virtually every phase of our national life. Economists, statisticians, and other experts already realize the gravity of the situation. Soon it will be apparent to everyone. Leaders in almost every walk of life must meet the challenge and solve the problems caused by the tumbling birth rate, for by its effect upon population growth it is striking at the very root of our social and economic existence.

The birth rate has been gradually decreasing the world over for many decades but, because of its welcome effect upon overpopulation, it was viewed with equanimity. Only recently has the risk of underpopulation, with its consequent social and economic dangers, been appreciated and that only by economists and population experts.

One of the oldest records of births in existence is that of Sweden (Fig. 1) which shows the slow decline for a century and a half and the rapid fall during thirty-two years of the present century. The latter was greater than in all the preceding one hundred fifty years. This is almost an exact picture of what has happened among all northern European people. Fig. 2 graphically shows the parallel birth rate drop of five western European countries.

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NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

*Presented at the Forty-Sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Lurcerne, Que., September 11 to 13, 1933.

For lack of space this address cannot be included here in its complete form, but will appear in the author's reprints and the current volume of the Society Transactions.

BIRTH RATE

The birth rate in the United States has been falling for a long time, but we have accurate records only since 1915, when the birth registration area was established. Recently this decline has been precipitous, as is graphically shown in Fig. 4. The birth rate in 1920 was 23.7, but in 1932 it was only 17.3 per 1,000 live births, perilously near the rate of 16.6, which is necessary to maintain a stable population. If the average

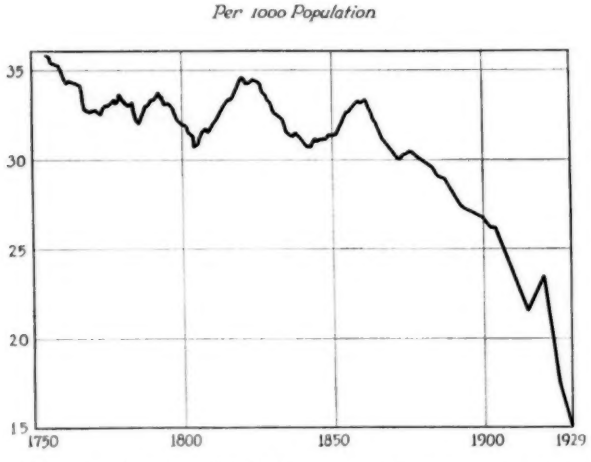

Fig. 1.—Showing the birth rate in Sweden since 1750.

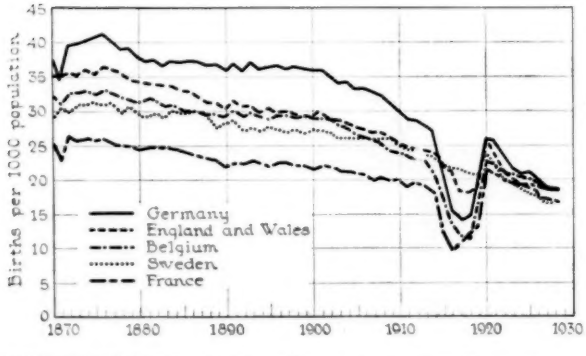

Fig. 2.—Illustrates parallel drop in the birth rate in five European countries. Note the sudden drop during the war period and the rise after the war. (After Baker.[8])

annual decrease in the birth rate for the last five years maintains, the rate for 1933 will be 16.4, which is less than that which is necessary to maintain the level of our present population (Fig. 4). It is startling to realize that there were 80,000 fewer babies born in 1929 than in 1928, and nearly 123,000 less in 1932 than in 1931. It has been asserted that present economic conditions are responsible for the falling birth rate. The depression may have some little effect but if one consults the curve in Fig. 4, he will see that the rapid drop began in 1921 and the speed of

its fall continued throughout highly prosperous years, preceding 1929, the year of business collapse. The drop in the birth rate is especially marked in the cities. The rural birth rate, while also declining, would be satisfactory, were it not for increasing migration to cities. In only

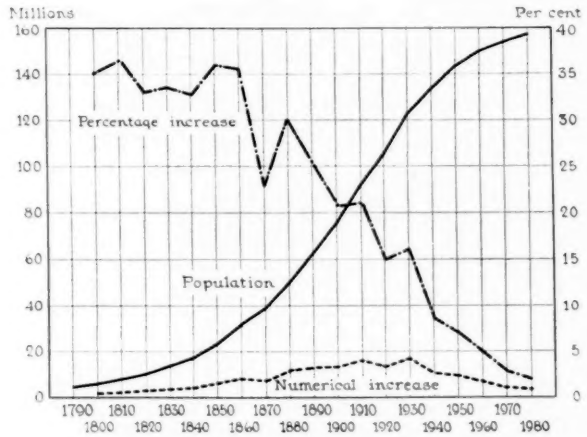

Fig. 3.—Illustrates population curves projected to 1980. Solid black line shows the logistic curve of population growth. Dot dash line shows the rate of population growth. Broken line shows the curve of numerical increase. Note the rapid drop in the rate of growth and numerical drop beginning in 1930. (After Thompson and Whelpton.[10])

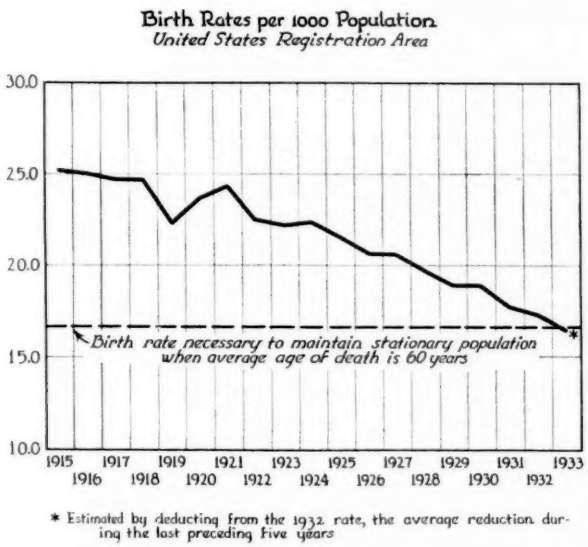

Fig. 4.—Birth rate curve in the United States, showing that the estimated birth rate in 1933 is less than necessary to maintain a stable population.

one of twenty large cities, in 1930, were there enough children, under five years of age, to maintain a stable population. On the contrary, in the farm population of twenty-four states, there were an average of 55 per cent more children under five, than necessary to maintain the popula-

tion level. "In the country the child is an economic asset, in the city an economic liability. The industrial revolution has brought a social revolution in its train and the need is to find a golden mean between the rural and the urban population." Perhaps the "back to the farm" movement should be encouraged. Fig. 5 graphically illustrates how much more rapid is the increase in the urban than in the rural population.

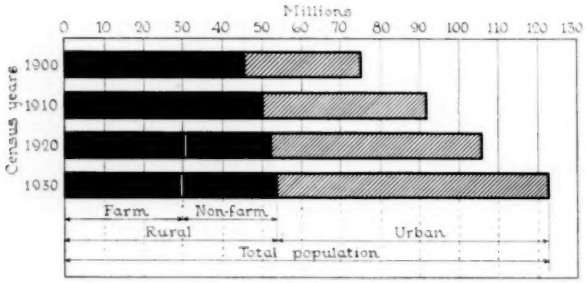

Fig. 5.—Shows the relative growth of population in urban and rural communities. (After Thompson and Whelpton.[10])

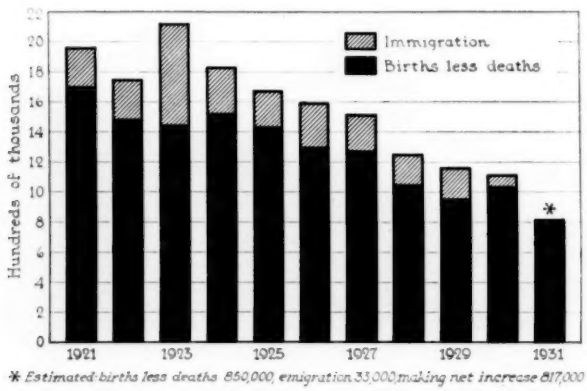

Fig. 6.—Illustrating growth of population due to births, less deaths, and to immigration. Note that increase due to immigration ceased in 1931. (After Baker.[8])

OUR POPULATION POLICY

Consciously, or unconsciously, our population policy has from the colonial days of William Penn, been for more people, "the open door" to immigration. This has of necessity been changed by the settling of all desirable lands. We had also "the open door" for children; large families were the rule. Farmers propagated their own farm labor; laborers did the same, to help support the family, and children were old age insurance. Now, however, largely by child labor and compulsory school attendance laws and migration to cities, the economic value of children to their parents, and the expense of their education, have made them an economic liability.

CHILDREN IN THE POPULATION

Children are diminishing. In 1930, for the first time, there were fewer children under five years of age than in the preceding federal census, and still more astonishing, there were fewer children under five, than between five and ten years of age. *In some cities there are not enough children to occupy the desks in the lower grades.* Soon the same condition will be true in high schools and colleges. (Thompson and Whelpton[10]). *"The social life of tomorrow is already determined by the children now living; literally, they are the future society"* (Frank[11]). The young America of today will be the America of tomorrow.

The ratio of children in the population to adults is falling, which of course is inevitable, with a decreasing birth rate. However, there is a

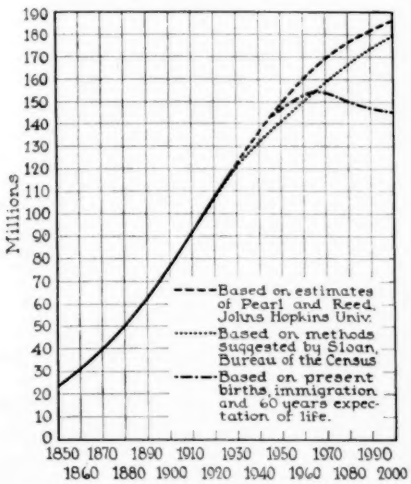

Fig. 7.—Showing estimates of population to 2,000 A.D. Note the difference in the estimates of a decade ago and now, shown by the drop of the broken line. (After Baker.[8])

large adult population, particularly native whites over sixty-five years of age, due to the rapid rise in the number of births from 1830 to 1865, and the moderate increase up to 1900, which will keep the elders rising for twenty or thirty years more. *When this influence has spent itself and the fewer children, now being born, reach adult life, the crisis in population will have arrived.*

POPULATION GROWTH

Although our population is still growing a little, the rate of growth is decreasing so rapidly that there is real reason for alarm. The rate of population increase during the last decade is the lowest in our history. (Fig. 3, dot and dash line). *During 1923 the population increased 2,125,000, but in 1931 it was only 870,000, which is smaller than for half a century.* The rate of population growth from 1870 to 1880 was 30 per

cent; from 1880 to 1890, 25 per cent; from 1890 to 1910, 20 per cent; from 1910 to 1920, 15 per cent, and from 1920 to 1930, 12 per cent. Fig. 6 illustrates the decreasing rate of growth of the population, due to the falling birth rate and the gradual disappearance of immigration. There was no increase by immigration in 1931.

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IMMIGRATION

In 1913 the excess of immigration over emigration was 945,000; in 1923, 745,000. In less than a decade the excess has entirely disappeared. In 1931, when the population increase was only 870,000, there were actually 120,000 more people who left the country than entered it. The death rate remained about the same, but the birth rate dropped 25 per cent. The falling birth rate and restricted immigration have made the population increase, in 1930, less than half of that of a decade before. If the immigration laws are not changed and the birth rate continues to fall, the population must inevitably become stationary, or even decrease in less than a generation. These are the compelling facts to which I referred in my opening sentence as the realities which are exerting a profound influence upon virtually every phase of our national life. The present generation is not reproducing itself, which is a national misfortune, leading eventually and inevitably to social and economic disaster.

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The consequences of the falling birth rate is a job for cumulative thinking. Nothing short of the combined intelligence of the nation can cope with the population predicament.

POSSIBILITIES OF MEETING THE CHALLENGE

What then can be done to counteract, in some measure at least, the effects of the declining birth rate? Much alteration by immigration seems remote, what with our attitude toward it and the slowing of population growth in countries which could send us desirable immigrants.

Only more children, or reduction of the death rate remain as a solution; the first is a challenge to the people themselves, and the latter a challenge to the medical profession, which in general it is meeting nobly, for death rates are constantly being decreased wherever possible. However, the death rates are relatively stable, so not enough further reduction to affect the population can be expected from the general death rates. But what about the possibilities of saving lives in our special field? Here much could be accomplished.

An overwhelming majority of child life is lost before, during, and soon after birth. Infant mortality, beyond the first year, is but a minor fraction of the total losses during childhood. About two-thirds of the total loss of prospective citizens, who die before the age of five, are due to stillbirths or deaths of the newborn and therefore might be saved by known preventive measures. These deaths, together with abortions and

deaths during the first year of life, due to obstetric causes which might be prevented, are sufficient to balance the entire fall in birth rate.

ABORTIONS

I am inclined to agree with those who assert that induced abortions may have quite as much and possibly more to do with the fall in birth rate than does contraception, great as it is. Be that as it may, we know that criminal abortions are greatly on the increase. Taussig[13] asserts that in his experience one-half of all abortions are criminally induced, and he found the astonishing proportion of one abortion to every 2.3 full-term births, 43.4 per cent. Applying this percentage to the 1929 census figures would yield the astounding number of 940,000 abortions. Taussig thought that an estimate of 700,000 abortions annually, in the United States, was not excessive. Rongy gives the staggering estimate of 2,000,000, or approximately one abortion to every live birth.

There is no way of learning the true incidence of abortion; it is too secretive a procedure for that. However, it certainly is not less than one to five live births, which would give the astonishingly high figure of 434,000 abortions, based on the census figures of 1929; many more than enough to counterbalance the drop in the birth rate and to maintain an increasing population.

The ethical medical profession has little contact with induced abortions until it is too late to prevent them, but if each practicing physician could have the opportunity of preventing one abortion annually, that alone would nullify the fall in birth rate. It might well be the only way out of the decreased population threat. While the situation as to abortions is a challenge to the medical profession for more watchful care during pregnancy, the real challenge is to society itself, for induced abortions are increasing.

STILLBIRTHS

Stillbirths are to a great extent avoidable. Adair,[12] who studied more than 1,000 fetal autopsies done at the University of Minnesota, said: "Analyses of large series of stillborn infants discloses the disheartening fact that a great majority are due to accidents of labor and, therefore, largely preventable, or to maternal diseases during pregnancy, also in a large measure avoidable before delivery." He found 67.2 per cent of stillbirths due to accidents of labor and 7.4 per cent due to syphilis; therefore 74.6 were preventable by treatment during pregnancy.

I have here anlyzed all of the stillbirths in the United States census reports of 1922, the first year that the U. S. Census Bureau (except one year, 1918) recorded complete stillbirth reports, and of 1929, the last published report. Great caution must be used in comparing stillbirth statistics, because of the varying definitions of stillbirth and the lack of proper certification by different states and cities. For this reason the Census Bureau selected a certain area in which special stillbirth certif-

TABLE I. PER CENT AND NUMBER OF STILLBIRTHS DUE TO PREVENTABLE OBSTETRIC CAUSES IN A CERTAIN AREA*

YEAR	TOTAL STILLBIRTHS IN U. S. REGISTRATION AREA	VIABLE STILLBIRTHS (SEVEN MONTHS PLUS)	PREVENTABLE CAUSES								
			PREMATURITY	PLACENTA PREVIA AND ABLATIO	TOXEMIA	PROLAPSE AND COMPRESSION CORD	MALPRESENTATIONS	DYSTOCIA	ASPHYXIA	SYPHILIS	TOTAL
1922	70,010	45,500	4.7%	7.7%	5.3%	13.7%	9.4%	14.2%	5.8%	3.5%	64.3%
1929	85,678	58,946	3.4	7.3	6.9	12.5	6.7	12.3	3.2	2.7	55.0
Total number in 1929			2,827	6,254	5,912	10,709	5,740	10,003	2,688	1,788	45,921
Preventable (viable) 1929			1,945	4,303	4,067	7,368	3,949	7,250	1,886	1,591	32,359

*1922: Connecticut, Illinois, New Jersey, District of Columbia, Baltimore.
1929: Connecticut, Illinois, New Jersey, District of Columbia, Baltimore, New York, Oregon, Utah, Washington.

TABLE II. INFANT MORTALITY UNDER ONE YEAR OF AGE AND STILLBIRTHS (DUE TO CERTAIN PREVENTABLE CAUSES), UNITED STATES REGISTRATION AREA 1920 AND 1929

	ALL CAUSES (EXCLUSIVE OF STILLBIRTHS)	STILLBIRTHS	TOTAL	OBSTETRIC CAUSES				PEDIATRIC CAUSES		
				STILLBIRTHS	PREMATURITY	BIRTH TRAUMA	SYPHILIS	CONGENITAL DEBILITY	INFECTIOUS DISEASES	DISEASES OF DIGESTIVE TRACT, ENTERITIS
1920, rate per 1,000 live births	85.8	39.0	114.8	39.0	19.4	3.7	0.9	7.7	22.6	16.1
1929, rate per 1,000 live births	67.6	39.0	106.0	39.0	19.1	4.8*	0.9	4.7	17.1	8.8
1929, per cent of obstetric deaths				60.4	26.1	7.2	2.1	4.2		
1920-1929, per cent increase (+) or decrease (−)	−21	±		±	±	+29.7	±	−39	−24	−45
1929 Actual number	146,661	85,678	232,339	85,678	37,931	10,320	1,720	6,092	35,569	16,300
1929 Possible saving of lives	22,000	28,000	50,000	28,000	10,000	7,000	1,500	3,500		

*Foreign rates: Canada, 4.3; England and Wales, 2.1; Scotland, 1.4; Holland, 3.7; Switzerland, 0.6; U. S. Negro, 2.8.

icates were used, making the data relatively uniform, comparable, and reliable.

In the U. S. registration area, in 1922, there were 70,010 stillbirths (39 per 1,000 live births) of which 45,500 were viable. In 1929 the rate per 1,000 live births was the same, the number being 85,678, of which 58,946 were viable.

In Table I the percentages of preventable obstetric causes, including syphilis, are shown; in 1920, 64.3 per cent and 55.0 per cent, in 1929, were due to conditions amenable to preventive measures. Of course, some stillbirths are inevitable, but a large percentage can be prevented. Assuming that these percentages are applicable to the registration area totals, of the 45,921 due to these causes, 32,359 babies were savable. It has been repeatedly demonstrated in health centers, prenatal clinics, and teaching maternities that about one-third of the gross number of stillbirths, due to obstetric causes, and approximately one-half of those which are viable, can be saved by proper watchfulness during pregnancy and good judgment and skill at delivery. Therefore it may be conservatively stated that 28,000 of the 85,678 stillbirths, in 1929, could have been saved.

PREVENTABLE INFANT MORTALITY

I have also analyzed the deaths during the first year of life, in the U. S. registration area at the beginning and end of the decade from 1920 to 1929, grouping them in Table II under preventable obstetric and pediatric causes. The rate, in 1920, was 85.8 deaths per 1,000 live births; the rate, in 1929, had dropped to 67.6 deaths per 1,000 live births, a decrease of 21 per cent.

Congratulations are due to the medical profession for this accomplishment in one decade, but when we obstetricians look at the figures and see that the entire saving of infant lives was in pediatric conditions, gratulations change to chagrin.

Pediatricians, by precept and example, have been able to impress upon the general profession, who of course care for most of the babies, the life-saving principles of pediatric practice; while obstetricians, although we have preached the precepts and by example have demonstrated in health centers, prenatal clinics, and in teaching maternities the life-saving principles, have not succeeded in having them generally practiced. In only one condition, congenital debility, is there any considerable saving of life and that we share with the pediatrician, for it is both an obstetric (prophylactic) and a pediatric (therapeutic) problem. In view of the failure to reduce the mortality in other preventable obstetric conditions, perhaps the pediatrician should get all the credit. Of the other conditions, only deaths from prematurity have dropped a puny 1.5 per cent which probably means nothing, and the rate from birth trauma has risen, and from syphilis has remained unchanged; two conditions which offer great opportunity for saving babies.

BIRTH INJURIES

Infant deaths from birth injuries increased during the decade from 1920 to 1929, 29.7 per cent. Frankel says it has increased 5 per cent a year since the birth registration area was established. Fatal birth injuries do occur in spontaneous and even in easy labors, but they are much more frequent in forceps, breech, and version deliveries.

Plass, in his White House Conference report, stated: "The most striking change in obstetric practice in the past decade and a half has been the great increase in operative deliveries. A certain few have raised their voices on every occasion, against the tide of radicalism, but apparently without stemming the rise."

FORCEPS DELIVERY

In his extensive survey Plass notes many foreign statistics of the forceps delivery incidence, as in the neighborhood of 3 per cent, while the incidence in 207 representative general hospitals in the United States, with 121,000 deliveries, the incidence of forceps deliveries was 17.4 per cent, and concludes by saying: "When the use of forceps is limited to the actual need, instrumental delivery is uncommon and probably represents not more than 5 per cent in any given consecutive series. Any great increase over this figure savors of meddlesome midwifery."

From an analysis of numerous large series of forceps deliveries, the writer has concluded that approximately 6 per cent of all babies delivered by forceps, will be either stillborn or suffer a neonatal death. With low forceps the rate is 3 per cent; with midforceps the rate is five times higher, about 15 per cent, and with high forceps, at least 30 per cent, ten times as dangerous as normal delivery or the low forceps.

BREECH DELIVERIES AND VERSION

The after-coming head in breech or version delivery is particularly susceptible to intracranial injury, due largely to pressure upon the occipital bone, leading to falx and tentorial tears. The death rate is about 10 per cent. Skilled operators will not lose so many, but the average physician, without marked skill, will lose more than 10 per cent.

Ehrenfest[16] asserts: "In a large series of autopsies made subsequent to breech labors, and particularly after versions and extractions, the immediate cause of death is found to be of traumatic origin, in 80 to more than 90 per cent."

Birth trauma is more prevalent in the cities, because of the higher incidence of operative interference, especially the larger ones, where the operative furor has taken its greatest hold.

Table III graphically illustrates the death rates per 1,000 live births in cities with a population over 300,000, in 1920, and which were in the registration area at that time. Buffalo had the highest rate, 8.3 in 1920, Indianapolis and Philadelphia the lowest, with a rate of 2.9. Buffalo also had the highest rate in 1929, 10.4, which was an increase of 25 per

cent. San Francisco had the lowest rate, 3.2, which was a decrease of 21 per cent; Boston, Chicago, Cincinnati, Detroit and Minneapolis, also had decreased rates from birth trauma.

Perhaps some of the increase of deaths from birth trauma may be accounted for by improved reporting of such causes of death and to the greater number of autopsies that are secured now, than a decade ago,

TABLE III. DEATHS DUE TO BIRTH INJURIES IN 1920 AND 1929 IN CITIES WHICH HAD A POPULATION OF 300,000 OR MORE IN 1920

	1920	1929	
Buffalo	8.3	10.4	Increase 25 per cent
Cleveland	5.4	6.4	Increase 18 per cent
Washington, D. C.	4.9	6.0	Increase 22 per cent
New York	4.8	5.6	Increase 17 per cent
Pittsburgh	4.7	6.3	Increase 34 per cent
Milwaukee	4.4	8.0	Increase 80 per cent
Seattle	4.1	4.4	Increase 7 per cent
Baltimore	3.5	5.0	Increase 42 per cent
Los Angeles	3.5	5.0	Increase 42 per cent
Indianapolis	2.9	3.4	Increase 17 per cent
Philadelphia	2.9	4.7	Increase 21 per cent
Boston	7.5	6.5	Decrease 13 per cent
Chicago	7.4 (1922)	6.6	Decrease 10 per cent
Cincinnati	5.1	5.0	Decrease 2 per cent
Detroit	4.9	4.6	Decrease 6 per cent
Minneapolis	4.9	4.6	Decrease 6 per cent
San Francisco	4.1	3.2	Decrease 21 per cent

Buffalo had the highest rate, 8.3 per 1,000 live births in 1920, Indianapolis and Philadelphia the lowest, 2.9.

Buffalo also had the highest rate in 1929, 10.4, and San Francisco the lowest, 3.2.

but this cannot possibly account for all the increase. Furthermore, we know that the incidence of operative deliveries has grown apace during the last ten years. We know that there is an inevitable risk of injury in every artificial delivery, even in skilled hands, therefore the increase in operative deliveries alone would account for most of the added incidence of birth injuries.

SYPHILIS

Syphilis is placed in the obstetric preventable classification because such an overwhelming proportion of babies, born of syphilitic mothers, treated during pregnancy, are born at full term, without evidence of syphilis.

McCord[17] reports that 73 per cent of syphilitic mothers have full-term babies and that a baby can be prevented from having syphilis in practically every instance, if the mother is properly treated during pregnancy.

Syphilis is also a factor in premature births, in nearly half the cases.

It is a very conservative statement that 50,000 babies, who die before, during, and soon after birth, could be saved by watchful care during

pregnancy, sound, intelligent, skillful and conservative delivery, and watchful after-care. These procedures, together with even a small reduction in the number of induced abortions, would be sufficient to offset the reduced birth rate.

Radicalism on the part of the medical profession and a low appreciation of human values as to children and family life, on the part of the people, are taking a toll in baby lives which is appalling.

It has been thoroughly, repeatedly and convincingly demonstrated by the leaders of our profession that clear-headed, dextrous and conservative obstetrics will save for future citizenship a majority of the babies who now perish. Why the medical profession, in general, will not follow this wise leadership, and will follow false prophets, is difficult to understand. Seemingly they do not comprehend, or will not believe that any interference with the normal processes of labor is a very definite danger.

The public welfare demands that the known, thoroughly demonstrated life-saving measures be employed throughout the country, to the end that infant lives may be saved, not only as babies for the home but also as future citizens whose social importance is emphasized by their rapidly decreasing numbers.

It seems to me quite clear that the recent increased momentum of the falling birth rate, with the consequent contracting population growth, is a challenge to all the people in whatever activity of life, for in the last analysis, the needs, welfare, and happiness of the people are determined by adjustment to the size of the population.

There are two special phases to the challenge to the medical profession in view of the already existing excess of physicians, even for the present population, fewer students should be graduated, and to the active profession itself that it counteract the influence of the falling birth rate as much as possible by saving babies' lives. This definitely resolves itself into a battle between radicalism and conservatism.

Who then is a radical and who a conservative? I would define a radical as one who insists on frequently doing operative deliveries, perhaps supported by his own puny statistics, in spite of the proved danger, supported by enormous statistics, of any interference with the normal processes of labor.

The conservative, in contrast, is he who will not interfere with labor except upon sound indicatitons. He is afraid only of being wrong. He will fearlessly use operative procedures when they are indicated. In short, the true conservative is he who knows how and when, and particularly when not to be radical.

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RUPTURING THE MEMBRANES TO INDUCE LABOR*

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IN 1928 it was my privilege to present as a thesis before this Society a paper entitled, "Induction of Labor by Rupture of the Membranes and Administration of Pituitary Extract." In view of experience subsequently gained, certain changes have suggested themselves in the routine technic employed, and it is interesting to study the results obtained from observations made in the much larger group of cases presented now; viz.: 500.

Since writing my original paper, there have been two articles published on the subject; one by Guttmacher and Douglas of Johns Hopkins, in April, 1931, and another by J. Morris Slemons, in April, 1932. Comment in both instances was entirely favorable to induction by this method.

This group, consisting of 500 cases, has an additional interest because the cases date from the practices of five obstetricians and not from a single operator; in other words, in spite of the variations in technic and judgment, due to the personal equation, the results have been uniformly satisfactory.

In the title of this paper the former title reference to the "Administration of Pituitary Extract" has been purposely omitted, because I believe that rupture of the membranes is the essential for a sure start of labor, and because observations, since the original paper, have led to the belief that pituitary extract is not essential or dependable and that response to its use depends greatly on the stage of labor, and more particularly on the condition of the cervix.

If the cervix is flat or thin, when the membranes are ruptured, the start of labor is usually instituted so quickly and with such satisfaction that pituitary extract is not necessary. On the other hand, with the elongated, noneffaced cervix, it can be expected that satisfactory labor

*Read at the Forty-Sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Lucerne, Que., September 11 to 13, 1933.

The author of this article died January 1, 1934.

will be delayed until the cervix is "taken up" when, as stated above, labor will assume a satisfactory rhythm, obviating the need of pituitary injection. It is probable that, if pituitary extract is given after rupture of the membranes, when the cervix is long, the effacement will be somewhat hastened but I believe that "whipping up" the uterus in this early stage of labor many times leads to distressing conditions such as contraction ring and tonic contractions of the uterus. A little patience after rupturing the membranes, where the cervix is long, will allow the painless, constantly-present, uterine contractions plus the pressure of the presenting part to efface the cervix, after which true labor will start. I do not wish it to be inferred that pituitary extract should never be used in starting labor or that it is entirely useless in this field. I do believe, however, that certain conditions render its employment of doubtful value while others may make it a distinct hazard. The use of pituitary extract should be undertaken with reasoning judgment and it is my belief that the dosage should always be small.

SELECTION OF CASES FOR INDUCTION

All cases divide themselves roughly into two classes, so far as indications for induction of labor are concerned:

1. Cases where some prenatal complication such as toxemia, bleeding from partial or marginal placenta previa, hydramnios, slightly contracted pelvis, cardiac and renal disease, diabetes, etc., make induction imperative.

2. Cases at term where elective induction of labor seems desirable and safe, either from the viewpoint of the patient or the physician, but not for pathologic conditions.

In the first class, where pathologic conditions demand termination of the pregnancy, a decision must be reached as to vaginal or abdominal delivery. Having decided on the vaginal route, rupture of the membranes offers the simplest method for labor induction, and if it seems advisable, has the added advantage of permitting the subsequent employment of any other method ordinarily used, such as gauze packing or the introduction of bags, which I believe wholly unnecessary.

In the second class, without pathology, the problem is entirely different and becomes a matter of judgment of the maturity of the ovum and of those physical findings in the pelvis which point to the readiness of the generative tract for the onset of labor. It is, of course, understood that under no condition should elective induction of labor be attempted through the vaginal passage unless the operator feels secure in the fact that delivery may be safely completed by that route; that is, the compatibility between the passenger and passage must be complete.

The condition of the cervix is the most dependable criterion that the pelvic organs are ready for parturition and that the time of labor is at hand. If the cervix is well forward, flattened or thin, the os dilated one

or two fingers and the vertex in the pelvis, labor is imminent, induction will be satisfactory and the latent period short (viz.: time between rupture of membranes and onset of labor).

If the cervix is not flattened, with a long canal and an unopened os, labor will be induced by the rupture of the membranes but the total labor will be much longer and the latent period definitely increased. A low presenting part or one that fits firmly down into the lower uterine segment, with the cervix anterior, is favorable because it exerts a constant pressure on the cervix. On the other hand, a high presenting part increases the risk for the baby because of the increased chance for prolapse of cord and because of the greater difficulty for the physician to judge the relation between pelvis and baby, and therefore is a contraindication for rupture of the membranes.

ROUTINE AND TECHNIC

The changes made in the original procedure for induction by this method are the addition of castor oil and quinine, as preliminary medication to rupture of the membranes, and omission of the routine administration of pituitary extract after the waters are broken. A definite routine has been established for cases fulfilling the requirements for induction and about to be induced; as follows:

ROUTINE.—1. Patient enters the hospital at 8:00 P.M. on the evening before induction.

2. Is given nembutal, gr. iii, or luminol, gr. v, to insure a restful night.

3. Castor oil, 1½ oz., at 4:00 A.M.

4. Quinine, gr. x, at 5:00 A.M.

5. Quinine, gr. x, at 6:00 A.M.

6. Membranes ruptured at regular visit at 8:00 A.M. to 9:00 A.M.

The technic for rupture of the membranes has undergone only minor changes, and follows:

1. Patient is prepared and the vagina is filled with hexylresorcinol. This solution is used as the procedure requires no anesthetic, and hence, a preparation that does not irritate or burn is necessary.

2. A long hysterectomy clamp is easily slid along the examining fingers of the left hand and without force passed through the os uteri until its tip encounters the fetal head. The jaws of the clamp are opened slightly and then closed while held firmly, but not forcefully against the vertex. If the tips of the clamp close accurately they will pick up the membranes, which rupture as the clamp is drawn outward. The examining fingers are held in the vagina throughout this maneuver, acting as a guide for the forceps in regard to both its direction and its relation to the presenting part.

3. All the fluid that can be readily released should be encouraged to escape.

4. The patient is then put in the prone position and the fetal heart auscultated.

5. In the majority of cases, where the indications for elective induction have been properly judged, the uterus will show signs of contractions almost immediately. Where delay occurs at this stage or, in other words, where the latent period is prolonged, the judgment of the operator shall dictate whether he will use patience or pituitary extract. Labor will, I believe, ensue in any event.

The procedure outlined above is technically easy, safe and, from the surgical point of view, can be performed with complete cleanliness. In fact, the maneuver involves little more risk and liability to infection than the ordinary vaginal examination during labor.

TABLE I

Primiparas	164	33%
Multiparas	336	67%
Total Series	500	100%
Babies	504 (4 sets of twins)	

TABLE II. INDICATIONS FOR INDUCTION

Election	406	Diabetes	4
Toxemia	32	Cardiac	4
Overdue	17	Previous precipitate labor	4
Living at a distance	12	Macerated fetus (diagnosed)	2
Low attached placenta	6	Anencephalus (diagnosed)	1
Chronic kidney	6	Small pelvis	1
Discomfort at term	4	Hydramnios	1

TABLE III. AVERAGE HOURS

	FROM R. OF M. TO DEL.	LATENT PERIOD	ACTUAL LABOR
Total series	6.92 hr. (7)	1.55 hr. (1½)	5.61 hr. (5½)
Primiparas	10.83 hr. (10¾)	2.37 hr. (2¼)	8.46 hr. (8½)
Multiparas	5.35 hr. (5¼)	1.18 hr. (1¼)	4.25 hr. (4¼)
	Longest 39 hr. 55 min.	Longest 30 hr.	Longest 37 hr. 15 min.
	Shortest 20 min.	Shortest 0	Shortest 20 min.

For comparison with Table III, Table IV is a composite table made up from a part of one of the tables of Guttmacher and Douglas which gives a comparison for my own figures so far as we have carried them out in the same way.

TABLE IV

	NO. OF CASES	AVER. LATENT PERIOD PRIM.	AVER. LATENT PERIOD MULT.	AVER. LENGTH TOTAL LABOR PRIM.	AVER. LENGTH TOTAL LABOR MULT.	TERM NEONATAL MORTALITY
Artificial rupture	G. & D. 119	2.14	4.01	10.15	5.43	5.08%
Spontaneous	100	8.84	8.25	11.2	7.0	5.0 %
14396 consec. del. Johns Hop.	14396			17.59	11.75	5.16% total fetal mortality
Artificial rupture Jackson	500	2.37	1.18	10.83	5.35	3.0 %
Artificial rupture Jackson	500	Actual Labor		8.46	4.25	corrected fetal mortality
Artificial rupture Jackson	500					0.2 %

This series, comprising a total of 500 cases, is from my private records, augmented by those of Drs. Robert L. DeNormandie, Raymond S. Titus, Delos J. Bristol, and William A. White, Jr. The group represents consecutive cases with regard to the induction of labor by the method basicly founded on rupture of the membranes.

Tables I to VI give a condensed view of the results of this survey.

TABLE V. TYPE OF DELIVERY

	TOTAL SERIES		PRIMIPARAS		MULTIPARAS	
Normal	236	47 %	25	15 %	211	62.6%
Low forceps	198	39 %	98	58.7%	100	29.6%
High forceps	None		None		None	
Mid forceps	20	4 %	17	10.2%	3	0.8%
Breech extraction	9	1.8%	5	3 %	4	1.2%
Version	41	8.2%	22	13.1%	19	5.6%
Total Cases 500	Total deliveries 504 (4 sets of twins)					

TABLE VI. RESULTS

Mothers discharged well	500	100%
Mothers discharged dead	0	0%
Total babies delivered (4 sets of twins)	504	
Babies discharged well	489	97%
Babies discharged dead	15	3%
Corrected fetal mortality as reviewed below	1	0.2%

Review of fetal deaths

1. 4 Premature
   - 1 at 6½ months (nephritic mother)
   - 1 at 7½ months (toxemic mother)
   - 2 at 6 months (twins)
2. 5 Macerated fetuses
   - 1 at 6 months (mother chronic kidney)
   - 4 at term (2 diagnosed before induction)
3. 2 Stillborn
   - 1 mother in diabetic coma
   - 1 congenital heart with hydramnios and anencephalus proved by x-ray before induction
4. 3 Monstrosities at term
5. 1 Cerebral hemorrhage (a twin, weight 6 pounds, 12 ounces)

This paper would not be complete without mention of the subject of infections and complications in relation to this method of labor induction. No detailed observation has been made in this regard but from a general survey it is evident that these obstetric casualties are no more to be expected after artificial rupture of the membranes than when labor is conducted after the orthodox manner. Guttmacher and Douglas call attention to the fact that, notwithstanding vaginal examination and cervical manipulation necessary to the rupture of the membranes, there is no apparent increase in either intrapartum or puerperal infection and further state their belief that the shortening of labor is an important factor in this regard.

When final examinations are made at six weeks postpartum, the mothers are found not to be different from patients having spontaneous labor. The babies also are well and have shown no more tendency to the accidents of birth or abnormal development subsequently than those born by "letting nature take its course." It would seem that with care the probability of the "prolapsed cord" was not more to be expected than is its average occurrence in obstetric practice and that it, together with the dry uterus and consequent dry labor, is not a cause for worry in relation to this procedure.

CONCLUSIONS

1. Rupture of the membranes has proved to be a safe and satisfactory method of inducing labor, with more certain action than other methods.
2. Preliminary medication of castor oil and quinine is helpful to the procedure while pituitary extract after rupture of the membranes is of doubtful value.
3. Elective cases should be carefully judged. Condition of the cervix is the best indication of readiness for labor.
4. Labor thus induced is shorter than usual labor at term.
5. Maternal morbidity and infection not increased, probably decreased.
6. There is no apparent effect on the babies.
7. Patient is under observation throughout labor, and she is saved the anxiety of rushing to the hospital while in severe pain and having frequent contractions. If barbiturates or other hypnotics are used, they can be administered early for the patient's comfort. She also has had a night's sleep and is well rested when labor begins.

Whether the induction be elective or imperative, this method of starting labor artificially has a definite place in the practice of obstetrics, and again I confidently recommend it for trial.

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DISCUSSION

DR. B. G. HAMILTON, Kansas City, Mo.—It has been most disappointing to me that an analysis of my own cases has been far inferior to those I have reviewed. The only consoling thought to me in my own work has been that in comparing a similar number of patients who have gone into labor normally with a like number reported by other obstetricians who have had patients with normal labors, my results have compared favorably. Again those patients who have gone into labor normally, the end-results have been far superior to those I have induced. This causes me to draw different conclusions which I shall follow, namely: that the induction of labor has a very limited field for me.

I agree with Dr. Jackson that if an induction is to be done, if the head is engaged, and if the cervix is soft, rupturing the membranes is the safest type of induction to be considered. I formerly gave caster oil before rupturing the membranes, but in several instances because of the depletion from the oil and the stress of labor, I was compelled to interfere unnecessarily. In my own series of 160 patients 12 had temperatures of from 100° to 104° that lasted from one to five days, necessitating their being removed from the obstetric floor. No infections were definitely proved, yet they were not disproved. This was most disquieting. In eclamptics the rupture of the membranes has seemed to be of value; aside from this I have questioned its value unless for definite indications. I agree that when an induction is to be done, with the head engaged and a soft cervix, rupturing the membranes offers the best results.

DR. LEROY A. CALKINS, KANSAS CITY, MO.—Dr. Jackson said that the labors artificially induced were shorter than labors that were not induced. I would like to make the point that his conclusions are not entirely correct because, with his selection of cases, the head low in the pelvis, the cervix anterior and thin, there would naturally result shorter labors whether artificially induced or not.

DR. J. K. QUIGLEY, ROCHESTER, N. Y.—I think Dr. Jackson's low mortality is due to his selection of cases, and to his very wise criteria regarding the length of the cervix and the position of the head. Dr. Jackson's figures prove that the dry labor is not the terrible thing that we once thought it to be. Three years ago when I analyzed over 300 cases of labor in elderly primiparas, there were 82 in which the membranes ruptured spontaneously before labor and these patients had shorter labors by an average of over three hours. I think that the chief danger in induction by rupturing membranes is the prolapse of the cord. There is not a great deal of danger of maternal infection.

DR. HOWARD F. KANE, WASHINGTON, D. C.—Incarceration of the anterior lip of the cervix between the head and pubes seems to me happens more frequently when the membranes are ruptured before the cervix has become fully dilated.

This accident delays labor and traumatizes the cervix. Many times the cervix must be pushed back to allow passage of the head. This can rarely be accomplished without laceration of the cervix. It is comparatively easy to repair these lacerations, however, and the results are usually good.

DR. JACKSON (closing).—Any of us would condemn and abandon any method of induction which gave such calamitous results as Dr. Hamilton has confessed to. In rebuttal to this I can only refer to the statistical diagrams of my own results and others quoted in the paper just read.

Dr. Hamilton has mentioned the danger of this procedure in the hands of the untrained and inexperienced physician doing obstetrics. I am quite in sympathy with this statement. If an obstetrician cannot tell when the cervix is flat or taken-up and the os dilated, he will be much better off to await nature's dictates.

If the induction of labor falls into the class of imperative rather than elective induction I still believe rupturing the membranes offers the simplest and safest method now at hand.

Because my cases are not the universal run but are a selected group, Dr. Calkins has questioned my statement that labor after induction by rupture of the membranes seems to be shorter than average labor. I will remind him that about 20 per cent of my cases (as shown by Table II) fell outside the purely elective group. It is also true that the series of Guttmacher and Douglas were much less rigidly selected, and yet, their cases and the series in which spontaneous rupture of the membranes occurred before the onset of labor, both averaged much shorter labor than the large consecutive group taken from the Johns Hopkins Hospital (see Table IV).

Dr. Quigley has mentioned the possibility of prolapsed cord following rupture of the membranes. This condition has been carefully watched for; it has not occurred either in my cases or in the other groups studied. It is my opinion that if care is taken not to dislodge the presenting part, there will be no more expectancy of prolapsed cord than is to be found in the usual obstetric statistics.

I cannot account for Dr. Kane's report of the increased occurrence of edema of the anterior cervical lip. In my own experience the condition has not arisen often enough to attract it especially to my attention.

HISTOPATHOLOGY OF EPITHELIAL HYPERPLASIA AND NEOPLASIA OF THE CERVIX UTERI*

HENRY SCHMITZ, M.D., F. A. McJUNKIN, M.D., AND
M. A. MACALUSO, M.D., CHICAGO, ILL.

AN EXAMINATION of amputated cervices by serial sectioning was begun by us several years ago. Our aim was to make a microscopic study of the hyperplastic changes in the squamous epithelium of cervices showing a chronic cervicitis. As set down in the literature, the microscopic changes described as characteristic of beginning cervical cancer are so varied and conflicting that they are unconvincing, and many pathologists, perhaps the majority, refuse to venture any suggestion of malignancy except where the growth is frankly cancerous and would be uniformly so diagnosed by all. In certain of our cases, pathologists of nation-wide recognition submitted a diagnosis of early cancer, while others of equal experience, found in the same microscopic sections, no evidence that signified to them the presence or imminence of malignancy. When such a situation exists, it is obvious that further investigation is required. In the meantime it is our opinion that it would be best for pathologists and clinicians to encourage cooperation by recognizing a blastomatoid condition of the cervix uteri. Of course the cervical epithelioma like other epitheliomas is at first a surface growth. How may it be recognized at this time?

Pathologic Procedure.—The cervices were fixed in toto in formaldehyde. The blocks of tissue were cut out in the axis of the cervical canal so that the microscopic sections would include the epithelial transition at various places. The blocks were about 3 mm. thick and most of the muscle was cut away to facilitate sectioning. Skip serial sections were employed in one of two ways: from some blocks 15 sections were mounted from the first, middle, and last portions; others were cut into paraffin ribbons and every twentieth section mounted. Sections were stained with hematoxylin and eosin.

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From the Departments of Gynecology and Pathology of the Loyola University School of Medicine.

Aided by a grant from the Chicago Institute of Cancer Research.

Results.—In the serial sections the character, origin, and extent of the lesions can be followed in a way not possible in single sections. In a preliminary study three sets of significant changes were recognized. They are present in advanced cervical cancer and certainly some of them are seen in the absence of malignant change. In varying degrees they are present in 15 of the 75 cervices showing chronic cervicitis. They refer to the epithelial cells, to the position and arrangement of the epithelium and to the stroma.

Nuclear Change.—Cystoplasmic changes consist of loss of differential characters especially intercellular bridges and lessened keratinization associated with a diminished reaction to iodine. The nuclear structure is dominant in hyperplastic and anaplastic reactions. Hyperchromatism is present in some degree wherever mitotic division is speeded up. Irregularity in size and shape of nuclei is seen in hyperplasia but is more

Fig. 1.—Point of transition of surface epithelium to an atypical type with lymphocytic infiltration beneath.

pronounced in neoplasia. In the first stage of cervical neoplasia the typical mitoses associated with excess chromosomes are infrequent. In 6 of the 15 cervices showing epithelial nuclear changes at some point, there was an abrupt transition between the new and the old squamous epithelium. In 3 instances (Fig. 1) this was very pronounced. Schiller[1] attaches great importance to this change in character of epithelium. It is due to the hyperchromatism of the cells and the increase in ratio of nucleus to cytoplasm.

Epithelial Heterotopia.—By the method of serial sectioning the penetration of the stratified epithelium into abnormal locations may be accurately determined. In the cervix the process of epidermoidization of the cervical glands is relatively common. The penetration of the stratified epithelium into abnormal locations may be accurately determined. In the cervix the process of epidermoidization of the cervical glands is relatively common. The stratified epithelium penetrates be-

neath the columnar cells and the latter disappear and the entire gland may become a solid plug of squamous epithelium. Glandular epidermoidization was seen altogether in 14 cervices but was present only twice in cervices showing pronounced blastomatoid changes. It appears that normal, hyperplastic, and neoplastic epithelium may participate in the epidermoidization of the cervical glands. In nonglandular areas the penetration of the squamous epithelium to an abnormal depth may be considered as a heterotopia. In this way epithelial pearls may form in both cancer and inflammation. Much of the discussion of the breaking through of the membrana propria fails to take into account the obvious facts. Cancer begins as a surface growth and whether proliferation be cancerous or merely inflammatory the resulting cells must pile up or press downward. In both instances the epithelial surface is apt to be-

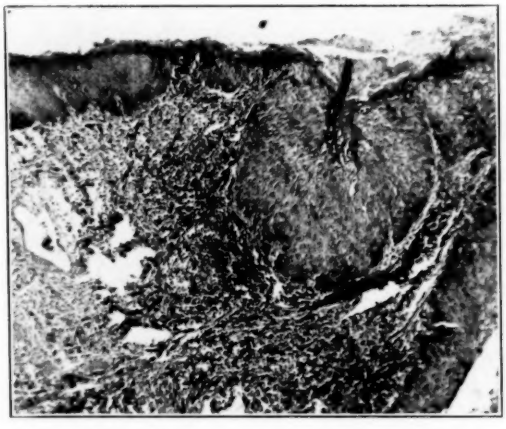

Fig. 2.—Atypical surface epithelium with much lymphocytic infiltration beneath. At one margin of the photograph is seen the heterotopic extension of epithelium into a laceration.

come thickened and distorted. Epithelial heteroplasia as interpreted above was present in all 6 cervices that showed other blastomatoid changes.

Stroma Reaction.—In the more recent discussions of cancer the presence of characteristic structural features in the cancer cell has been thrust into the background but the idea of an essential difference in the protoplasmic composition of the cancerous and noncancerous cell is generally accepted. It is not at all unlikely that microchemical developments may in the future make possible a demonstration of this changed composition. Stroma reaction about cancer has frequently been examined in the grading of tumors, and it should be considered more often in connection with beginning cancer. The tumor cell which microscopically is so like the normal cell or like the normal cell that is regenerating actually is different in its protoplasmic constituents. It contains to some extent protein that is foreign to the host. Loeb[2] has shown that

autotransplants of the thyroid gland produce little or no reaction while homotransplants are surrounded and invaded by lymphocytic cells. In 6 cervices showing other blastomatoid changes cells of the lymphocytic series had appeared in the stroma next to the proliferating epithelium. In one instance the reaction was slight. (Fig. 2.) Of course the stroma reaction to which we attach significance appears where it cannot be explained by ulceration or other inflammatory processes on the surface and in the glands.

Discussion and Summary.—A method for the characteristic staining of the malignant cell is not available. Pathologists and clinicians should file all biopsy material so that it may be checked against the subsequent clinical history of the cases. The registration of bone sarcomas by the American College of Surgeons has proved the effectiveness of the procedure. The huge mass of clinical pathologic observations on precancerous cervical lesions are unconvincing because like most problems of this type they cannot be subjected to the kind of confirmation that results from animal experimentation. In our material the cervix was removed rather completely, but countless biopsy specimens are examined yearly. Frequently and for a variety of reasons only the biopsy specimen is removed and the remaining cervical tissue is not removed or otherwise destroyed. We have seen these surface epithelial thickenings of atypical appearance and with lymphocytic accumulations in the stroma beneath, and we are aroused to know the later history when for one or another reason the changed epithelium is not removed.

In 6 cervices nuclear changes were associated with some penetration of the cells into the deeper tissues, but in all the growths were essentially on the surface. In one of these few lymphocytes were present beneath the proliferating epithelium. Although the 3 kinds of blastomatoid changes are present in the 6 cervices to a degree less than that found in the later stages of cervical cancer, they should be made known, and interpreted in the light of all evidence available. Serial sectioning of the entire cervix, or the portion of the cervix evincing macroscopic changes, is desirable for the identification of these blastomatoid changes. In all, the changes covered rather wide areas and extended through one or more blocks. However, in the serial sections the growth activity of the epithelium can be followed to best advantage.

When in addition to the anaplasia and hyperplasia of the epithelium there is a stroma reaction like that of true epithelioma and in addition a penetration of the epithelium into abnormal locations, we are of the opinion that the epithelium has undergone malignant changes. The treatment then should consist of an extended radical hysterectomy or an extended radical radiation treatment.

Chronic cervicitides whenever found during postpartum, yearly health, or general physical examinations of every patient coming to a physician's office, should be treated, whether they cause or do not cause symp-

toms. Cauterization of the cervix as advised first by Hunner[3] in 1906 should be done. If the cervix does not heal or a recurrence takes place after the cauterization, then it is deemed advisable to remove the diseased part of the cervix by amputation. The operation is a simple procedure. It removes the diseased parts totally and material is obtained for serial sections and microscopic examinations to rule out or in malignancy. Careful follow-up should be had for at least five years.

The writers are convinced that the detection of chronic cervicitides and their adequate treatment as suggested and a scrupulous microscopic examination of serial sections will put the medical profession in control of cancer of the uterine cervix.

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DISCUSSION

DR. WALTER T. DANNREUTHER, NEW YORK CITY.—Dr. Schmitz has recorded histopathologic observations which are a distinct contribution to the early diagnosis of carcinoma of the cervix. Every clinician who assumes the responsibility for treating cancer should feel obligated to look through the microscope with the pathologist, because it adds greatly to his own knowledge of the disease, and the correlation of the clinical and microscopic data is often of value to the latter. Pathologists are not to be criticized because they differ in opinion; even clinicians disagree at times. In view of the fact that our only immediate hope of reducing the cancer incidence lies in the prompt recognition of significant tissue alterations, the demonstration of criteria for prophylactic therapy is of paramount importance. Dr. Schmitz and his coworkers are to be commended for their patience in preparing so many serial sections.

As Dr. Schmitz states, when changes in the nuclei of the cells, proliferation of squamous cells into the deeper structures of the portio, and stroma reaction are all observed in the same section, the pathologic changes can justifiably be regarded as precancerous, irrespective of mitosis. Whether epidermoidization of the cervical glands represents a process of heteroplasia or metaplasia is still a moot question. While it is probably true that a given lesion is either a carcinoma or it is not, it is logical to assume that there are stages between the normal, or benign pathologic states, and the well-defined picture which we all recognize as a carcinoma, that represent the prodromal stage of the malignant neoplasm. Personally, I have viewed with suspicion all sections which showed either a suggestion of metaplasia or a deep penetration of squamous cells, when accompanied by a marked lymphocytic infiltration, despite the lack of such a scientific basis for a positive diagnosis as Dr. Schmitz has offered. It seems reasonable to regard a pronounced leucocytic infiltration as Nature's effort to resist the advancement of an inflammation or a malignant neoplasm.

Of course, it would not be expedient to amputate the cervix routinely or indiscriminately for diagnostic purposes, and biopsy specimens must be utilized as a rule. I have been disappointed in iodine staining as a diagnostic procedure, have found topical applications of 10 per cent copper sulphate useful as a diagnostic test, but always take generous biopsy specimens with a large wire loop and the high tension cutting diathermy current. An enlightening experience some years ago taught me always to take two biopsies from a lacerated cervix, one from the anterior

and one from the posterior lip. In the case referred to, a specimen was taken from the most suspicious area on the posterior lip, and no evidence of cancer could be detected. The cervix was incidentally amputated at the time of operation, and a typical carcinoma found in the anterior lip. I have not had the courage to amputate or cauterize the cervix in any case in which there seemed to be even a possibility of malignancy, but have treated such patients with radium and x-ray or by hysterectomy exactly as though the diagnosis were unquestionable.

DR. LOUIS E. PHANEUF, BOSTON, MASS.—Until we know the cause of cancer, at which time the treatment may be entirely changed, prophylaxis remains our main point of attack.

In recent years we have become familiar with the Schiller test and with colposcopy as advised by Hinselmann, for the early detection of cancer of the cervix. Dr. Schmitz and his coworkers have given us a histologic procedure which is more accurate than the two preceding. He has emphasized the significant blastomatoid changes in chronic cervicitis; namely, nuclear changes, heteropia, and stroma changes.

Since there is the possibility of overlooking an early carcinoma in the ordinary biopsy, his method of cervical amputation and the making of serial sections more nearly approaches the ideal. Cervical amputation in itself is a benign intervention. Obviously, he advocates amputation only when the cervix has failed to heal by cauterization. I would add to cauterization the conization of the cervix with the high frequency current by the technic of Hyams.

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—I would ask Dr. Schmitz if he has found any relation between these histologic changes and the period of the menstrual cycle during which the specimen was removed? McFarland in Philadelphia has shown us that pathologists have repeatedly mistaken the hyperplasia occurring in the breast during menstruation for cancer. He insists that the pathologist should know the time in the menstrual cycle during which the specimen was removed before making a diagnosis, just as many breasts have been removed with a histologic diagnosis of carcinoma where later study showed that the hyperplasia was physiologic.

DR. SCHMITZ (closing).—As far as the relation between menses and tissue changes are concerned, the specimens are always removed in the intermenstrual period. So observations on tissue changes during menstruation were not studied. Recent investigations have shown that characteristic cellular changes during menstruation and also during pregnancy occur. However, I am not willing to associate these tissue changes with the transition stages between benign hyperplasia and true carcinoma.

PREGNANCY AND RHEUMATIC HEART DISEASE*

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THE material for this paper has been obtained from three sources: first, from personal interviews with 43 private and public patients with rheumatic heart disease who have borne children; second, from a study of 56 cases of rheumatic heart disease proved at autopsy; and third, from a study of 41 case histories of public ward patients with rheumatic heart disease confined at the Toronto General Hospital.

Rheumatic heart disease is the commonest type of heart disease causing serious anxiety during pregnancy, and mitral stenosis is the usual evidence of its presence. It is a progressive disease which usually begins during childhood or early adolescence and results in a damaged myocardium, the extent of which is often difficult to estimate. As a result it is frequently impossible to judge whether a heart has the functional capacity to stand the strain of labor and parturition. It is evident that during pregnancy an additional strain is put upon the heart, normal or diseased. The blood volume is increased; the mother has additional body weight as well as the weight of the pregnancy; changes in the maternal metabolism play their part; the upward displacement of the diaphragm decreases the vital capacity and displaces the apex of the heart outward. These factors are mostly beyond control and may in themselves prove too great a burden for the diseased heart to bear. This strain of pregnancy on the heart is then climaxed by the physical effort of labor.

Although the strain of pregnancy cannot be avoided it may be minimized by removing other sources of physical strain or by complete rest in bed. It is evident, therefore, that the progress through pregnancy of a patient with rheumatic heart disease depends not only on the ability of the heart but also upon the patient's opportunities to rest. In other words the social and economic status of the patient is of very great importance when considering the advisability of a contemplated pregnancy or of terminating an already existing one. This is illustrated by Table I which is a comparison of the histories of private and public cases.

The histories were taken of 21 parous women not then pregnant, attending the public cardiac clinic at the Toronto General Hospital, and compared with the histories of 22 private patients. In the public Out-

*Read at the Forty-Sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Lucerne, Que., September 11 to 13, 1933.

Patient group it was found that 10 patients had developed failure during pregnancy while in the private group only 5 had developed failure.

Of the 10 patients in the public group who had developed failure, 3 developed it during the first pregnancy and 7 in subsequent ones (2 in the fourth, 1 in the fifth, and 4 in the seventh). Of the private patients who developed failure during pregnancy 3 developed it during the first and 2 in subsequent ones (one in the third and one in the fourth).

TABLE I. COMPARISON OF PRIVATE AND PUBLIC OBSTETRICAL CASES WITH RHEUMATIC HEART DISEASE

	NO. OF CASES	PRIMIP.	MULTIP.	AVERAGE PARITY	FAILURE DURING PREGNANCY
Public	21	4	17	4.0	10 (7 multip. 3 primip.)
Private	22	12	10	2.8	5 (3 multip. 2 primip.)
Of the multiparas who developed failure in the public group					2 were para iv 1 was para v 4 were para vii

These findings emphasize the fact that rheumatic heart disease is a progressive lesion and a patient of twenty years may stand pregnancy and labor as a primipara without failure or even symptoms, yet the same patient some years later may die of failure in a subsequent pregnancy. The history of one uneventful pregnancy is no criterion that the heart will stand the strain of another pregnancy.

A question that yet awaits an authentic answer is whether pregnancy shortens the life of a group of patients suffering from rheumatic heart disease. It is undoubtedly true that an individual patient may find the burden of pregnancy too great and die of myocardial failure during pregnancy or labor, yet it is conceivable that the same patient might have died of failure at about the same age apart from pregnancy. It is at least questionable if pregnancy by itself does definitely shorten the life of a group of such cases. The physical effort of caring for children may be of as much importance as bearing them. Reid[1] presented statistics of 40 cases of rheumatic heart disease confirmed at postmortem and found that the men died at a slightly earlier age than the women, while the average age of death for the single and married women was almost identical. A previous report by the same author[2] was very similar. McIlroy and Rendle[3] found that relatively more multiparas fall in the class of advanced heart disease and used this as an argument that multiple pregnancies tend to lower the cardiac efficiency. The conclusion may be correct but the reasoning is faulty. If the average age of death of females suffering from rheumatic heart disease is from thirty-five to forty years, including both married and single, it is obvious that repeated pregnancies will be encountered at those years to-

ward the end of the childbearing period. We reviewed the autopsy records of 56 proved cases of rheumatic heart disease at the Toronto General Hospital, the results of which appear in Table II.

TABLE II. POSTMORTEM CASES. TOTAL NUMBER 56

	MALE		FEMALE
Number of cases	19		37
Average age of death	38.7 years		36.4 years
	Nulliparas	(16 cases)	30.6 years
	Multiparas	(20 cases)	38.3 years
	Para i	(4 cases)	35.0 years
	Para ii and over	(14 cases)	40.0 years

One history had no data in regard to pregnancy
Two histories had no data in regard to number of pregnancies

The average age of death for the females (37 cases) was 36.4 years and the males (19 cases) was 38.7 years, yet for the females who had more than one pregnancy (14 cases) the average age of death was forty years, while the average age of death of the nulliparous group (16 cases) was thirty years. We do not argue from these figures that childbearing tends to prolong the life of such patients but only that the longer a married woman with a rheumatic heart disease lives the more children she will probably bear. The prime factor determining the length of life of a patient with this disease is the extent of myocardial damage and the frequency of exacerbations of the rheumatic infection. If the damage is extensive, the patients die before they marry or have many children; if the damage is slight, death occurs later and more pregnancies occur during the longer life. Nevertheless we cannot say that these parous patients with an average age at death of forty years might not have lived longer if they had had no children. Of the 21 public cases in Table I only 8 were unaffected by pregnancy, for in addition to the 10 developing failure during pregnancy, 3 had the symptoms aggravated shortly after delivery.

In this paper we have only considered mitral stenosis as the evidence of rheumatic heart disease and as the common serious lesion encountered during pregnancy. It is interesting, however, to consider the usually neglected simple mitral regurgitation. This is the only heart lesion that still leaves a patient eligible for life insurance. The Metropolitan Life Insurance Company this year published a report on such cases showing that men under forty years of age suffering from mitral regurgitation had a mortality rate between two and three times the normal. After age forty the increased rate is less but even at the best is 40 per cent in excess of the normal. Women with the same lesion show a relatively greater increase than the men, but this is not marked until after the age of forty. Such figures make it evident that even simple mitral regurgitation is worthy of careful attention in the pregnant patient.

The relative risk of pregnancy in heart cases is difficult to estimate. Hamilton and Kellogg[4] found nearly 20 per cent of the maternal deaths at the Boston Lying-In Hospital were due to heart disease, yet only about 1 per cent of all pregnant patients had severely injured hearts. Reid[5] estimates the average mortality from cardiac disease complicated by pregnancy as from 5 to 10 per cent.

At the Toronto General Hospital there were 28 deaths in 5,850 consecutive births or a rate of 0.43 per cent. In 130 deliveries of rheumatic heart cases there were 11 deaths or a rate of 8.45 per cent. In the last 41 cases, however, there was only one death or a rate of 2.33 per cent.

An analysis of these last 41 cases appears in Table II; the previous 89 cases having been reported by Dr. W. B. Hendry.

TABLE III. DELIVERIES IN 41 RHEUMATIC HEART CASES

	NO. OF CASES	PRIMIPARAS	MULTIPARAS
No symptoms	16	5	11
Symptoms:	25	10	15
Failure	9	4	5
Died	1	–	1
Dangerously ill	6	5	1
Premature labor	13		
Type of Delivery:			
Spontaneous	16	5	11 (one died)
Forceps	6	5	1
Cesarean section	19	6	13

Of the 41 patients 16 had no symptoms of heart disease during pregnancy and puerperium, and the lesion was diagnosed on routine physical examination. The remaining 25 patients had symptoms of varying degree; 9 having failure, one dying, and 6 being dangerously ill immediately after delivery. It is interesting to note the high incidence of premature births, 13 out of 41 cases. The method of delivery reveals a relatively low incidence of forceps and a high incidence of cesarean section, a relationship which should probably be reversed. Two sections were done for other reasons than the existing heart disease and all the patients were sterilized at the time of operation.

TREATMENT

Dogmatic rules cannot be laid down regarding the management of obstetric patients with rheumatic heart disease but certain general principles may be considered.

During Pregnancy.—Every patient should have the combined attention of a cardiologist and an obstetrician. The results at all institutions where such a plan has been followed make this quite clear.

The economic position of the patient will have much to do with our general advice. In the case of the well-to-do rigid restrictions regarding household duties, other exercise and freedom from petty anxieties may be carried out at home. The poor patient may be sent to hospital

as soon as it becomes evident that she cannot take sufficient rest at home, but the great middle class constitute the most difficult problem. Their resources will not provide sufficient help in the home nor can they meet the expense of prolonged hospitalization, except in the public ward where they will not go. It is in this class of patient that many pregnancies are terminated that under other circumstances might be carried through. Although physical rest is the principal factor in treatment the importance of avoiding intercurrent respiratory infections is to be remembered.

Impending failure means complete rest in bed from then until the time of delivery. If actual failure supervenes the failure must be treated and not the pregnancy. Any attempt at delivery of a patient not in labor during failure is contraindicated. Whether all heart cases should have digitalis toward the end of pregnancy is an undecided question.

The diet of the pregnant patient with rheumatic heart disease should be modified to some extent. The physiologic increase in weight occurring during pregnancy, particularly if the increase is excessive or the patient already obese, should be controlled by suitable restriction of fat and carbohydrate. If the patient has ever had failure or failure seems imminent then the salt should be restricted.

During Labor.—The factors causing strain during labor are pain and anxiety, loss of sleep, absence of food, and muscular work.

The proper use of sedatives during the first stage of labor relieves pain and prevents the undue loss of sleep. Heroin in $\frac{1}{12}$ grain doses administered hypodermically is an excellent sedative and may be repeated frequently. Morphine may be used when a stronger drug is required. Hyoscine, because of its frequent exciting effect, is preferably not used in these cases. In the occasional case when the first stage is unusually prolonged, rectal analgesia is valuable.

Dehydration and starvation are prevented by the administration of light, nourishing food in the early part of the first stage and glucose either by mouth or intravenously later in labor.

The greatest muscular effort occurs during the second stage of labor, and this should be eliminated as far as possible by the judicious use of forceps. If the first stage is unduly prolonged, the occasional use of a bag or even cesarean section is indicated.

The safest anesthetic for delivery is ether, and if cyanosis is present, oxygen should be administered with it.

During the Puerperium.—It is not unusual for a patient to go through her pregnancy and labor without failure only to develop it during the puerperium. The first ten days are particularly crucial, but all patients should remain in bed at least three weeks and many of them for much longer periods. After the patient is out of bed ample unbroken sleep

is essential which means that nursing at night is omitted. Most patients with symptoms should not nurse their babies.

The question of further pregnancies is one to be carefully considered. If there has been threatened or actual failure, no further pregnancies should be considered. The same is true if economic conditions do not allow of proper assistance in the home. If the patient and her husband are intelligent and cooperative, contraceptive advice may be all that is necessary. In other cases sterilization should be advised. As regards the latter there is one point which is important, that is the advisability of sterilization is not an indication for cesarean section. If section has to be done for other reasons, of course, the tubes are resected at the same time, otherwise the sterilization is done after the puerperium, when the risk is less than the risk of a cesarean section. The mortality of the latter operation still remains about 5 per cent in spite of occasional series where the mortality is lower. From 1928 to 1932 there were 224 cesarean sections done at the Toronto General Hospital with 9 deaths or a mortality rate of 4 per cent. During the same period there were 54 patients operated upon for sterilization apart from cesarean section with no mortality. Most of these latter cases were done by abdominal section but in a few the tubes were resected per vaginum, and where such an approach is feasible, it is the method of choice.

CONCLUSIONS

1. Rheumatic heart disease is the commonest type of heart disease encountered during pregnancy.
2. Pregnancy is frequently the exciting cause of myocardial failure.
3. Dogmatic rules cannot be laid down for the conduct of labor or the advisability of pregnancy.
4. Advice given to a patient in regard to the advisability of a contemplated pregnancy or the conduct of an existing one must be determined with careful consideration of the patient's economic circumstances.
5. The management of a pregnant patient with rheumatic heart disease requires the cooperation of a cardiologist and obstetrician.
6. It is at least questionable whether the average age of death of a large group of rheumatic heart cases is shortened by pregnancy, if the economic position of the patient is considered.
7. There is a general tendency to be too radical in the method of delivery of rheumatic heart cases.

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MEDICAL ARTS BUILDING

DISCUSSION

DR. G. D. ROYSTON, ST. LOUIS, MO.—Regarding the bearing-down efforts during the second stage, I presume the large number of patients referred to with normal deliveries were patients with premature babies. If not, we have found it is rather hazardous to have the patient have a long bearing-down second stage. We have given these patients either hyoscine morphine or 6 gr. of sodium amytal by mouth. If there is a rigid cervix or a large baby, the patient is delivered by abdominal section under local infiltration. When delivered from below, I have found local anesthesia very serviceable.

DR. A. J. RONGY, NEW YORK CITY.—The unknown factor in cases of heart disease associated with pregnancy is the extent of the myocardial involvement. So far we have not discovered a clinical sign which would indicate the myocardial integrity. However, in some cases we can occasionally judge the reaction of the heart to mild exercise by making the patient sit up and then lie down on the table a number of times or walk around the room. If the myocardium is in fair condition, there will be a normal reaction on the part of the heart, and there will be an increase in the pulse rate. If the myocardium is damaged, the patient's heart will not respond to these slight exercises, and the pulse rate will remain the same. This sign was often helpful to me in judging the heart of a patient during her pregnancy.

In no other group of patients have I found twilight sleep so well suited and helpful in the first stage. Of course, in all these patients labor should be artificially terminated as soon as the first stage is over.

DR. L. A. CALKINS, KANSAS CITY, MO.—I wonder if the essayist has had my experience, namely that almost as large a number of patients present myocardial failure following thyroid disease and such infections as influenza, as present myocardial failure following rheumatism?

Another point which I cannot vouch for but which is an observation of one of the better known cardiologists of the country, is that with proper supervision of the heart disease during pregnancy therapeutic abortions are unnecessary, and with proper supervision of the patient during the labor and puerperium, there have been almost no deaths reported where delivery has been done by cesarean section.

DR. SCOTT (closing).—It is only within the last two years that at our clinic we have had a special study of these cases so far as they have been conducted under the combined attention of a cardiologist and an obstetrician. Previous to that it was more or less a question of casual consultation with the medical side.

Dr. Royston mentioned the dosage of digitalis administered. We have arrived at no conclusion whether these patients should be digitalized before or after they come to labor. The medical men, looking upon it not as heart disease and pregnancy, but simply as heart disease, seem to feel that the use of digitalis is contraindicated until such time as symptoms of impending failure have arisen. We are coming to the conclusion that all of these patients should be digitalized before coming to labor. We regard it as important to eliminate any bearing-down efforts in the second stage of labor. In the spontaneous deliveries the patients had premature labor or were anesthetized and delivered so rapidly toward the end we were not aware that they were having any marked bearing-down pains.

Dr. Rongy's remarks regarding twilight sleep were interesting since we have been rather loath to use hyoscine in heart disease. We arrived at that opinion because some years ago when we were using twilight sleep in normal cases at the hospital, some patients showed undue excitement, and fearing the possibility of that we have

discontinued the use of hyoscine for analgesia. We have found that we can give these patients the necessary rest and sleep during the first stage by the methods that were mentioned.

Dr. Calkins pointed out the great importance of respiratory infection. We have recently had a death of a patient with heart disease at our hospital, following a fairly sharp attack of influenza a short time before delivery. We have had no case where we could find any definite connection between preexisting thyroid disease and the cardiac condition.

Dr. Davis raised the question as to what is meant by heart disease, and a very pertinent question it is. We did not wish to obscure the somewhat indefinite conclusions we had by including syphilitic and other types of heart disease, and we took as our criteria the presence of mitral stenosis and a definite history of rheumatic fever, either one or both of these factors being present in every case. Of course, in the postmortem cases, there was no question of there not being definite, pathologic evidence of heart disease.

We feel that, because we may wish to sterilize a patient, that in itself is not an indication for a cesarean section. If we feel that the patient should have a cesarean section because of her heart disease, that conclusion should be arrived at entirely apart from consideration of whether she should or not be sterilized, because we feel that the operation of sterilization after the puerperium is over is much safer than the cesarean section by itself.

THE LENGTH OF LABOR. III*

The First Stage: Labor Pains and Consistency of Cervix

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IN TWO previous communications[1, 2] it was pointed out that such clinical factors as age, height and weight, length of conjugata vera, size of the baby, and duration of the pregnancy have little or nothing to do with the length of labor, particularly the length of the first stage of labor. It was suggested in those communications that the consistency of the cervix was probably a very important factor in determining the length of the first stage. It was further suggested that the character of the labor pains might be a much more important factor than we have previously thought. No doubt Rudolph's recent publication[3] was prompted by much the same line of thought. It is probably unfortunate, however, that he should attempt to divide obstetricians into two schools of thought, placing such well-recognized authorities as Schauta, De Lee, Williams, Cragin, Holmes and Burdick, Bumm, Kerr, Eden and Holland, Solomons, Commandeur, Brouha, Goodall, Beck, Danforth and Grier, Maxwell, and Longaker in the "anatomicophysiologic school" and inferring that their management of labors was based solely on a study of the anatomy and physiology of the individual patient without employing any particular clinical judgment. And then placing such other well-

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known men as Bailey, Lull, Hirst, Newell, Stein and Leventhal, Quigley, Laferty, Tweedy, Baer, Courtiss and Fisher, and Kreis in the category of "clinical school," and inferring that these men manage their labors on the basis of clinical interpretation and judgment without reference to the anatomicophysiologic relation in the individual patient. Permit us to suggest that a better obstetric ideal would be the study of the anatomy and physiology of the individual patient utilized to develop one's clinical judgment over a period of years, which clinical judgment could then be applied to the anatomy and physiology of the individual patient to real advantage. Has that process not been true of the masters past and present?

In our previous communications we have attempted to analyze the importance of the anatomic factors as to their effect on the length of labor. This present communication aims at the study of the physiology of the first stage of labor with the hope that some little improvement may be made in our clinical judgment in the future. No reference to the second stage of labor will be made at this time. It has been previously shown that the factors governing the progress of the second stage and the length of the second stage are quite different from those operative in the first stage and that, therefore, they demand separate discussion.

THE CERVIX

By definition, the first stage of labor has to do entirely with the effacement and dilatation of the cervix. The main obstructive factor, therefore, is this structure known as the cervix. No doubt the length of the canal, the thickness of the wall, and the amount of dilatation previous to the initiation of labor pains are important factors in determining the amount of resistance which the cervix will offer to the progress of the first stage. To obtain an accurate concept of the amount of resistance that will probably be offered in any given patient, one must necessarily study each of these factors in addition to the fourth resistant factor determined by noting the consistency of the cervix. This present study, however, is limited to this fourth factor alone. This is not done with the idea of minimizing the importance of any of the other three factors but only with the idea of learning more about the importance of the consistency of the cervix.

To this end each individual patient has been carefully examined and the relative degree of softness of her cervix recorded when she was first seen in labor. If she presented a "normally" soft cervix this fact was recorded with the figure 3; if her cervix were definitely softer it was labelled with the figure 2. The occasional cervix of "mushy" softness was labelled 1. On the other extreme a cervix which might be described as "firm" or "tough" or "unyielding" was labelled with a figure 4. A "hard" cervix has not yet been felt but would be labelled with a figure 5. It might be interesting to note the distribution of cases since

this plan was adopted: 1, 17 cases; 2, 115 cases; 3, 122 cases; 4, 20 cases.

It is surprising that we should have labelled so many as 115 cases with the figure 2, indicating that they were softer than normal. This proportion would seem unduly high on the basis of expectancy in biologic variation but, as will be seen later, it is accounted for by the preponderance of soft cervices in multiparas where the number of 2's exceeds the number of 3's. The proportion of 2's in primiparas is relatively small. This study presents the consistency as carefully noted in the first examination in labor but, more recently, it has been noted in every subsequent examination until full dilatation is reached. This repeated observation of the consistency of the cervix shows conclusively that in a large porportion of cases the cervix becomes softer as dilatation proceeds. Whether this progressive softening is a normal phenomenon of usual occurrence or even necessary to normal progress of labor we cannot say, as a sufficiently large number of determinations are not yet available. This present communication will deal only with the consistency of the cervix as determined early in labor. On the basis of this single finding it is interesting to note the average length of the first stage for the various consistencies of the cervix as follows:

PRIMIPARAS			MULTIPARAS		
1-cervix	5 patients	6.0 hours	1-cervix	12 patients	6.9 hours
2-cervix	56 patients	8.9 hours	2-cervix	59 patients	8.0 hours
3-cervix	73 patients	13.6 hours	3-cervix	49 patients	10.6 hours
4-cervix	15 patients	20.5 hours			

In order to indicate a little more definitely the spread of the duration of labor with the various types of cervices, Table I indicates the frequency distribution in certain arbitrarily selected lengths of labor (to show only the difference between the 2-cervix and the 3-cervix). There was not a sufficient number of cases to similarly analyze the 1-cervix and the 4-cervix to advantage. It will be noted that for primiparas the 2-cervix means a labor of from four to thirteen hours, with the greatest

TABLE I. DURATION OF FIRST STAGE

CONSISTENCY OF CERVIX

NUMBER OF PATIENTS COMPLETING DILATATION IN CERTAIN ARBITRARILY SELECTED PERIODS FOR EACH CATEGORY OF CERVIX CONSISTENCY

		2 HOURS	4 HOURS	8 HOURS	12 HOURS	OVER 17 HOURS
Primiparas	2 cervix	2	16	20	17	
	3 cervix		7	18	23	24
Multiparas	2 cervix	16	13	27		
	3 cervix	3	3	21	19	

number in the eight-hour group. The 3-cervix, on the other hand, means a labor of from eight to an unlimited number of hours, with the largest number of cases coming in the thirteen-hour and in the unlimited-hour group. For multiparas a 2-cervix means a labor of from two to eight hours and a 3-cervix a labor of from eight to thirteen hours.

These results are sufficiently suggestive that we feel more than repaid for our study and feel that we can earnestly recommend the adoption of this or a similar plan to others.

THE LABOR PAINS

In studying the labor pains we have attempted to note carefully frequency in minutes, duration in seconds, and intensity by an arbitrarily selected method. This method was as follows: A contraction sufficiently hard that the uterus cannot be indented by moderate pressure with a single finger at a point on the fundus not directly over the body of the baby was labelled as a pain of 3-intensity. If the uterus could be slightly but not definitely indented the intensity was labelled with a 2. Definite indentation of the uterus meant to us a still weaker contraction and was labelled with a 1. Numerous instances of pains weaker even than this were labelled with a 1–. On the other extreme, there were a very few instances of pains which were apparently harder than normal. These pains were labelled with a 4, recognizing that it is almost impossible to determine the difference between our Grade 3 and Grade 4 pains. For the most part these Grade 4 pains occurred in the second stage of labor and do not properly come into consideration in this communication. (This very simple method of determining pain intensity was selected for its practicability as all previous methods have been too cumbersome for general use.)

Inasmuch as we have, at the present time, accurate data on only some 300 patients, we cannot present a more intricate analysis than to utilize the separate criteria of labor pains individually. It is quite obvious that all three factors must be considered together to arrive at the most accurate conclusion as to the results of the labor pains in any given case. Such accurate analysis cannot be made with so small a series as we have, at present, available.

It is also recognized that each of these characteristics changes in many instances as labor progresses. It has been very interesting to us, however, to note that the character of the first few pains in the labor determines to a very great extent the character of the pains throughout that particular labor. We have noted only one instance where pains occurring at intervals of three minutes at the beginning of the labor became as far apart as ten or fifteen minutes later in the labor. The converse occurs with considerable frequency. Nevertheless it would seem from this study of a small group of cases that the character of the initial pains is carried through the whole of the first stage in a remarkably

large proportion of cases. We, therefore, noted particularly the character of the first few pains and this analysis is based entirely on the first few pains of the labor with no analysis of subsequent pains.

Frequency.—We divided our patients into groups on the following basis: Group 1, pains not over three minutes apart at the onset of labor; Group 2, pains three and one-half to five minutes apart; Group 3, pains six to ten minutes apart; Group 4, pains over ten minutes apart. The average duration of labor in these various groups is shown below and the frequency distribution in Table II.

	PAIN FREQUENCY		
Primiparas	Less than 3 minutes	33 patients averaged	7.5 hours
	3½ to 5 minutes	51 patients averaged	11.9 hours
	6 to 10 minutes	41 patients averaged	14.1 hours
	Over 10 minutes	28 patients averaged	16.7 hours
Multiparas	Less than 3 minutes	19 patients averaged	2.4 hours
	3½ to 5 minutes	34 patients averaged	6.8 hours
	6 to 10 minutes	29 patients averaged	9.6 hours
	Over 10 minutes	36 patients averaged	10.9 hours

TABLE II. DURATION OF FIRST STAGE

FREQUENCY OF LABOR PAINS

NUMBER OF PATIENTS COMPLETING DILATATION IN CERTAIN ARBITRARILY SELECTED PERIODS FOR EACH CATEGORY OF PAIN FREQUENCY					
	2 HOURS	4 HOURS	8 HOURS	13 HOURS	OVER 17 HOURS
Primiparas					
Not over 3 minutes apart	5	11	9	7	1
3½ to 5 minutes apart	2	11	18	12	8
6 to 10 minutes apart	3	4	11	8	15
Over 10 minutes apart		1	8	10	9
Multiparas					
Not over 3 minutes apart	16	2	1		
3½ to 5 minutes apart	8	11	10	4	1
6 to 10 minutes apart	1	9	12	5	2
Over 10 minutes apart	1	10	11	10	4

It is obvious that frequency of labor pains is a very important consideration. This is not new information but, perhaps, the degree of differences has not been fully appreciated.

Duration.—We divided our patients into four groups on the basis of duration of the initial labor pains as follows: Group 1, less than ten seconds; Group 2, eleven to twenty seconds; Group 3, twenty-one to thirty seconds; and Group 4, over thirty seconds. The results expressed in terms of average duration of labor and the frequency distribution of cases are shown here and in Table III.

Whereas a longer labor pain seems to make for more rapid progress in multiparas, the differences are not very great, and in primiparas the duration of the pain seems to have no effect on the length of the first stage. From a practical point of view it would hardly seem worth

		PAIN DURATION
Primiparas	Less than 10 seconds	18 patients averaged 12.9 hours
	11 to 20 seconds	53 patients averaged 13.1 hours
	21 to 30 seconds	50 patients averaged 12.6 hours
	Over 30 seconds	15 patients averaged 14.0 hours
Multiparas	Less than 10 seconds	19 patients averaged 11.2 hours
	11 to 20 seconds	52 patients averaged 9.1 hours
	21 to 30 seconds	28 patients averaged 5.8 hours
	Over 30 seconds	10 patients averaged 6.3 hours

while to continue to determine accurately the duration of the individual labor pain as a routine.

Intensity.—Whereas we determined intensity by the figures 1, 2, 3, and 4, it was evident, when it came time to analyze the results, that there were many more patients in the 1 group than had been anticipated at the beginning of this study. A different rating or classification would prob-

TABLE III. DURATION OF FIRST STAGE

DURATION OF LABOR PAINS

NUMBER OF PATIENTS COMPLETING DILATATION IN CERTAIN ARBITRARILY SELECTED PERIODS FOR EACH CATEGORY OF PAIN DURATION

	2 HOURS	4 HOURS	8 HOURS	13 HOURS	OVER 17 HOURS
Primiparas					
Up to 10 seconds		3	7	4	4
11 to 20 seconds	2	8	16	14	13
21 to 30 seconds	3	13	15	10	9
Over 30 seconds	2	3	2	4	4
Multiparas					
Up to 10 seconds		2	9	4	4
11 to 20 seconds	10	16	15	8	4
21 to 30 seconds	7	10	8	3	
Over 30 seconds	4	1	3	2	

ably have been worth while. To avoid misunderstandings in our clinic we have continued our original classification and, in this analysis, therefore, the division into groups is made on the following basis (see also Table IV):

	PAIN INTENSITY	
Primiparas	1– (very weak pains)	31 patients averaged 19.4 hours
	1 (weak pains)	78 patients averaged 11.7 hours
	1–, 2, 3 (moderate and strong pains)	47 patients averaged 8.5+ hours
Multiparas	1– (very weak pains)	45 patients averaged 11.5 hours
	1 (weak pains)	54 patients averaged 6.8 hours
	1–, 2, 3 (moderate and strong pains)	24 patients averaged 3.7+ hours

It is quite obvious from the above and from Table IV that primiparas with very weak pains will have long labors regardless of the frequency or duration of those pains and regardless of the consistency of the cervix, as more than half of our cases in this group had a labor in

excess of twenty hours. With slightly stronger pains the labor was most apt to run from eight to thirteen hours, and with moderate or good intensity, the labor was from four to eight hours. The results were even more marked in multiparas, as, with moderate or good pains the labor was about two hours in two-thirds of the cases and from eight to thirteen hours in over half the patients with very weak pains. This is particularly striking when it is remembered that this is without regard to duration or frequency of the pains or consistency of the cervix. It would seem that this simple method of determining pain intensity is eminently practical and that it offers a definite aid in prognosis as to duration of labor and, therefore, should be helpful in management.

TABLE IV. DURATION OF FIRST STAGE

INTENSITY OF LABOR PAINS

NUMBER OF PATIENTS COMPLETING DILATATION IN CERTAIN ARBITRARILY SELECTED PERIODS FOR EACH CATEGORY OF PAIN INTENSITY

	2 HOURS	4 HOURS	8 HOURS	13 HOURS	OVER 17 HOURS
Primiparas					
1– "Very weak" pains			6	7	18
1 "Weak" pains	1	11	29	23	15
1+, 2, and 3 "Moderate" and "good" pains	7	16	12	9	2
Multiparas					
1– "Very weak" pains	3	8	16	12	6
1 "Weak" pains	8	21	15	9	1
1+, 2, and 3 "Moderate" and "good" pains	16	4	3		1

DISCUSSION

It is unfortunate that there is not in our series, at the present time, a sufficient number of cases to make it possible to analyze these characteristics of the labor pain one with the other and the three in conjunction. We can only say that intensity and frequency each has an important bearing on the duration of the first stage and that duration of the individual pain is of little or no importance. It is likewise unfortunate that we cannot at the present time balance the motivating power of the labor pain against the resistance of the cervix as determined by its consistency. We hope to continue this work until a sufficient number of carefully recorded cases is available to warrant more definite conclusions.

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DISCUSSION ON THE PAPERS OF DRS. ADAIR AND CALKINS

DR. FREDERICK H. FALLS, CHICAGO, ILL.—An interesting point in Dr. Adair's paper was the failure of quinine to affect the uterine contractions as shown by the graphs, so that if confirmed, quinine can hardly be responsible for the death of the fetus *in utero*, which is supposedly due to asphyxia caused by the oxytocic action of the drug on the uterus. If quinine is the cause of the fetal death, it must be the effect of the drug directly on the fetus. However, one should realize that there are probably no two uteri which react the same to stimulation and no preparations of ergot exactly the same and that, therefore, a large number of cases will have to be observed in order to reach reliable conclusions. We discontinued the use of gynergen a few years ago because clinically we could see no effect on the uterus from its use. Dr. Adair's experimental work confirms this clinical impression.

Dr. Calkins' paper is valuable from the attempt to evaluate in a scientific way the strength of the uterine contractions. Some years ago I tried to get at the matter in a different way, measuring the electric current produced by using a galvanometer over the uterus when it was contracting, in an attempt to measure the action current. I found there was some deflection of the needle during contraction, but it was not strong enough to be used as a measure of the force of the contractions.

I was surprised at the results obtained in this series of patients, as regards prognosis, and the fact that from the first few pains one could judge regarding the character of the labor; that if the pains started strong and were of a long duration in the first place, that condition continued throughout. We have seen so many cases that start out with strong pains and then taper down, or start out with weak pains and then suddenly for apparently no reason become strong, that we have felt there was no clinical criterion that could be relied upon to use as a prognostic guide.

DR. B. G. HAMILTON, KANSAS CITY, MO.—Neither of the essayists has so much as suggested that pain in labor is no longer a problem. On the contrary, they have a new thought that should be the beginning of a new chapter in obstetrics, namely: the significance of uterine contraction and pain in labor. It is very evident that if later reports are as conclusive as Dr. Adair's preliminary report, we will be compelled to revise our teachings.

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—Dr. Adair has referred to the well-known variations in the activity of ergot. Recent evidence from Duryee and others shows that we have in the United States ergot poisoning as well as in Europe. Apparently a considerable proportion of the rye consumed is spurred. The difference is that in Europe the rye flour is used without preliminary storage and while the ergot is still potent, whereas in this country the flour is kept in storage for a considerable period of time and the ergot deteriorates.

This is of particular interest in relation to the large number of vascular disturbances, such as gangrene of the extremities, that occur in persons of the foreign population and who live to a large degree upon rye bread. In individual instances it has been found that the rye consumed was heavily contaminated and had recently been imported from Europe on account of the flavor. It is quite possible that the ergot thus consumed may influence certain patients during pregnancy.

DR. JAMES E. DAVIS, ANN ARBOR, MICHIGAN.—With regard to both Dr. Calkins' and Dr. Adair's papers, it would be interesting to have included in the series of observations the constitutional types of each individual, because constitutional differences refer us to the differentiation of the entire form of body, or perhaps the local differentiation of the uterus, of the cervical portion, of the blood vessels, etc. The reaction time of each patient would be valuable additional information.

DR. ADAIR (closing).—With reference to Dr. Davis' question, the two cases shown are individual ones. The immediate postpartum observations are graphs which were selected from some 25 different cases. The eighth day postpartum observations are other individual cases which were selected from a larger series. I do not believe that we feel in a position to draw any very definite conclusions from what we have shown in these graphs and obviously one is not anxious to run an unlimited series of these cases. They all represent selected cases, in some of which the observation was part of a therapeutic procedure that was deemed necessary, or else was a substitute for other methods as in the case where a hydrostatic bag was used instead of a uterine pack. The introduction of the bag on the eighth day postpartum was a procedure which might be regarded as being unwarranted, but we selected the cases very carefully and felt that we incurred no great risk to the patient. I should hate to have this interpreted as a feeling that we were carrying on experiments which entailed risk to the patient or that we were advocating absolute freedom of experimentation in order to determine what occurs physiologically and as a result of the use of therapeutic agents. I would most earnestly urge very great caution in carrying out any work of this kind. So far we have had no occurrences which apparently modified the convalescence of these patients, but to say that it was not possible to have some untoward results would be, I think, an overstatement of the truth.

I think we can, however, draw certain definite, at least temporary, conclusions. One of those is that ergot is certainly not reliable in its results in individual cases. We feel that there are probably two factors, one the individual patient and the other the preparation itself.

With regard to the use of the pituitary preparations, the pitressin certainly had a definite oxytocic principle. Any one who uses this preparation with the idea that it has no effect on uterine contractions should certainly use it with very great caution. When quinine is used there seemed to be no definite action on uterine muscle. Of course, we all know that patients vary in their reactions to quinine. Some patients may respond very actively. We were not able to demonstrate any effect on uterine contractions with gynergen. Here again we would not want to say that gynergen never produces any contractions. Histamine had no apparent effect on uterine contractions. We were very cautious in its use because of its systemic effects. We gave a dosage about twice that used in histamine tests and far in excess of any amount which could be contained in the dose of ergot which was administered. We did not go into the question of uterine sedatives very extensively. We did try adrenalin without very marked results on uterine contractions. We observed the effect of pitressin in two hysterotomies and one cesarean section. We got very marked uterine tetany with definite contractions of the uterus. We were able to see the effect of pitressin, which also corroborates our findings with the hydrostatic bag.

DR. CALKINS (closing).—I perhaps did not state clearly at the outset that our object in making these records and presenting this analysis was to show that internes and general practitioners could make use of a method such as this to determine the probable duration of labor in the individual patient. Our experience has demonstrated this method practicable in this way. I also failed to state that we do not regard methods such as this as having the intimate accuracy of some of the other more cumbersome methods requiring apparatus for their use. No doubt the Western Reserve method is more accurate but it is hardly practicable for a man out in the country and in the private home. What we wanted was something that could be applied to the individual patient to determine prognosis and to determine management of labor.

Dr. Davis referred to the question of constitutional types. That was not gone into except so far as that point was covered in two previous communications where we did take up those factors and found, contrary to our former belief, that they have no appreciable effect on the length of the labor.

Dr. Falls referred to an important consideration, namely the spasm of the cervix. Morphine will relax the cervix in some cases, not always; whether because of difference in the dose of morphine or difference in the individual reaction to the morphine, I do not know. He also referred to another important consideration, namely the change in the character of the labor pains and felt that perhaps our figures were not in accordance with his own experience. Everyone recognizes that as labor progresses the pains do become more frequent, of longer duration and of greater intensity, and that was so stated in my paper. At least, that happens frequently but not in anything like all of the cases. However, the reverse happens relatively infrequently. We do know that pains that have once become good do not become poor. There may develop secondary inertia, but otherwise if the pains are good at the beginning of the labor they do not become poor. In this short series it was shown that in only one patient did the pains become poor after having been good at the beginning.

COMPLICATIONS RESULTING FROM PELVIC IRRADIATION FOR CANCER OF THE CERVIX*

PALMER FINDLEY, M.D., OMAHA, NEB.

THE general recognition of radium as the remedy *par excellence* in the treatment of cancer of the cervix has led to its adoption, not only by men especially trained in its application but by the general profession as well. Doctors are renting radium and applying it in their practice without possessing the requisite skill demanded both in diagnosis and technic. This is apparent when we compare their results with those obtained by men who are eminently qualified. Radium is a dangerous weapon in the hands of the novice and the untrained. It can work wonders but it is also capable of much harm. To obtain the maximum of results and to avoid unnecessary complications one must possess a thorough knowledge of cancer problems and a working knowledge of the physics of radium irradiation. This is more than can be reasonably expected of the general practitioner in whose practice cancer is but an incident. The successful management of cancer of the cervix implies the highest order of service; it requires skill and experience comparable to that of an expert. Zweifel says that proficiency in radiation therapy is more difficult to achieve than in surgery. No matter how proficient one may be in the application of radium, complications are bound to occur, but the damage done by unskilled workers in the field of radiation therapy may be and often is irreparable. There is such variation in

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methods of treatment it is difficult to make comparisons in results. This is so because of extraneous factors, indefinite and intangible, that influence the results of treatment and over which the doctor has no control. More and more the experienced radiologist is coming to appreciate the technical difficulties involved in the application of radium; he is increasingly fearful of resulting complications and of possible law suits. This fear, in many instances, restrains the operator from the application of maximum doses, to the detriment of his patients' welfare. The proper selection of cases for radium treatment is as important as is the technic of radium application.

Radium therapy has not yet emerged from the experimental stage. We are guided in large part by our own experience and that of others in determining the dosage for a given case, for there are many factors, some of them unknown, which determine the effects of radium upon the tissues. It would appear that the amount of energy applied to a given cell does not determine the destructive effect upon the cell. This has led to a divergence of opinion on the relative effects of a given amount of radium as compared with a smaller amount given over a longer period of time. For example, it is generally conceded that in slow-growing tumors the best results are obtained by applying a smaller amount of radium over a longer period of time.

While admitting that complications, resulting from radium irradiation, cannot always be avoided even in the hands of the most expert, yet we have advanced far enough in our knowledge of radium therapy to avoid many of the pitfalls which beset the early workers in the field. Grave complications, such as pyometra, parametritis and thrombophlebitis, are found in 9 per cent of 256 cases of cancer of the cervix cases reported by Kessler and Schmidt. The primary mortality of radium therapy is generally conceded to be in the neighborhood of 2 per cent, and is in large part due to an awakening of an unrecognized latent infection within the pelvic structures or to direct contamination of the field of irradiation. That such incidents may be largely controlled is evidenced by the experience of Dr. George Gray Ward who reports no deaths in Groups I and II, and 1.1 per cent mortality in advanced cases. More painstaking care in the preparation of patients for irradiation will materially reduce the casualties in advanced as well as in early cases. Where there is evidence of active pelvic infection or so much as a suspicion of the existence of infection, a period of rest should precede irradiation, together with such local applications as will favor the elimination of infection. I have had no deaths from infection following radium irradiation, but I have repeatedly occasioned a recrudescence of a pelvic inflammation, an event which has not failed to reflect upon my inability to recognize the existence of a latent infection.

Pyometra as a sequel to radium irradiation for cancer of the cervix is not a rare finding though often overlooked.

Guilhem and Gonzy, in 751 cases of cancer of the cervix treated with radium, report 8 pyometra, a percentage of 1.6 per cent. They ascribe the occurrence of the complication to two factors, first destructive effects of radium upon the tissue structures and second, infection introduced at the time of application of the radium. They affirm that a fatal termination is not infrequent.

Brooke Bland, in his review of the literature on pyometra, finds the incidence of the lesion in cancer of the cervix ranges from 3 to 10 per cent, but expresses the belief that the percentage is more nearly one-half of 1 per cent. Pyometra is not to be confused with that large class of cases in which there is profuse odorous discharge with no permanent retention within the uterus. Doubtless, as Bland says, many cases in which there is a continuous or intermittent discharge present a partial constriction of the cervix. The fibrosis, with subsequent contraction, developing late in the postirradiation period, is responsible for the block in the outflow of the uterine secretions. As a rule pyometra does not arise for several months following irradiation though it may develop within a few weeks. A foul discharge, occasionally blood stained, associated with pelvic pain of an intermittent type, is highly suggestive but the diagnosis awaits the dilatation of the cervix. Bland reports a case in which the uterus was distended to the size of a five months' pregnancy. The establishment of free drainage is all that is usually required, though vaginal hysterectomy may be necessitated where free drainage cannot be maintained. The application of radium in the presence of a pyometra is a dangerous procedure; it has added measurably to the fatalities resulting from the application of radium to a cancerous cervix. There would seem little excuse for overlooking the presence of pyometra. A preliminary dilatation of the cervix before applying radium should disclose its presence and avoid the very real risk involved. Where pyometra is disclosed the application of radium should be withheld awaiting the subsidence of the infection.

Where symptoms of cystitis arise shortly after irradiation, it is assumed that there was a preexisting and possibly unrecognized chronic cystitis, otherwise the rule is that cystitis does not manifest itself for two to four weeks following irradiation. The usual edema and congestion of the bladder mucosa, incident to irradiation, rarely persists beyond two to four weeks, but there are aggravated cases in which lesions of a serious nature develop one or more years later. Such lesions are insidious in their onset and too often are not connected up with the irradiation because of their delayed onset. The bladder wall becomes indurated, multiple indulant ulcers develop, and the mucosa becomes glistened and fissured and finally necrosed. Fistulas and fixation of the bladder are the end stages of a most distressing condition. In all this we see the evidence of excessive irradiation and the lack of precautionary measures in protecting the bladder from direct exposure to the rays. Where fistulas develop in the bladder or rectum soon after irradiation, it is presumed that cancerous invasion preceded the irradiation, a condition that, had it been recognized by a preliminary cystoscopic and proctoscopic examination, would have proscribed the application of radium. I have recently observed the unusual occurrence of a spontaneous closure of a vesicovaginal fistula caused by overirradiation, a most unusual occurrence. Ward cautions against overirradiation of the cervical stump

where the bladder rests upon the stump. In such cases he would materially reduce the dosage. He reports 40 cases of cancer of the cervical stump in 558 supravaginal hysterectomies (7.2 per cent), and in subsequent irradiations, a number of fistulas developed. He is not sure whether the irradiation or the disease was responsible for the fistulas.

Henry Schmitz* emphasizes clearly the danger of the spread of pelvic inflammatory lesions through the exciting influences of pelvic irradiation. Preexisting cystitis, pyometra, para- and perimetritis and tuboovarian abscess may eventuate in ureteritis, pyelitis, pyelonephrosis, and pyelonephritis. Schmitz finds compression and obliteration of the ureters resulting from scar tissue in the parametrium, and this in turn may lead to hydroureter and hydronephrosis, to pyelitis and pyelonephritis. It is prima facie evidence, as suggested by Schmitz, that in such cases the operator has erred in failing to recognize latent inflammatory lesions within the pelvis which, if recognized, would have contradicted the application of radium until all evidence of active infection had disappeared. It follows that precautionary measures are of the utmost importance if urinary complications are to be avoided in pelvic irradiation. The building of connective tissue in the parametrium and its subsequent contraction may lead to distressing consequences. This is a late development in which deep-seated pelvic pains, ureteral contractions and phlebitis develop. Before applying radium every means must be employed to determine the exact status of the pelvic structures. Latent inflammatory lesions, wherever located, are sources of possible danger and should be eliminated so far as possible before proceeding with irradiation. Irritating rays are excluded by proper screening. Vaginal packs and the insertion of a retention catheter together with adequate screening, in the absence of latent pelvic infections should very largely eliminate urinary complications.

Chronic vaginitis, with the formation of adhesions between folds of the vaginal walls, is a late development and is largely confined to the postmenopausal period. Here, again, excessive dosage and inefficient screening are responsible in large part.

The rectum is most often the seat of postirradiation sequelae. Mild forms of proctitis are difficult to prevent but the more severe forms are usually the result of failure to protect the rectum from impact of the radium by packing the vagina with gauze. Diarrhea and tenesmus are transitory complaints, rarely lasting more than a few days or weeks. Ulcers, fistula, and stricture are late developments and in most instances are the result of overirradiation. Fischer reported several cases of intestinal fistula with fatal outcome from the x-rays and one from the combined use of x-rays and radium. No cases have been reported of intestinal fistulas due to radium alone. We are admonished to apply radium sparingly where coils of small bowel are adhered in the pelvis.

Burum, in 42 cases, had 8 rectal fistulas (19 per cent); Wille, in 386 cases, had 10 fistulas (2.6 per cent); Heyman, in 502 cases, had 5 fistulas (1 per cent) ulcers 2.5 per cent, and slight stenosis 7.1 per cent; Ward, George Gray, in 558 cases had 22 fistulas (4 per cent); Döderlein, in 870 cases, had fistulas in 4.9 per cent but in the past year, with improved technic, his percentage was lowered to 0.6 per cent.

*Am. J. Roentgenol. 24: 47, 1930.

As a rule rectal fistulas do not develop for six or twelve months following irradiation. Small rectal fistulas are known to heal spontaneously.

We are all familiar with the extreme difficulty in closing these fistulas due to the tissue changes surrounding the fistulous opening. Thomas Jones says that the incidence of rectal and bladder fistulas is greater where no treatment is instituted than result from the application of radium. As a precautionary measure the bowel should be irrigated before applying radium.

Jeanneney records twenty rectal fistulas in 600 cases of cervical cancer, Berard and Cryssel five in 200 cases.

A most interesting phase of this discussion centers on the effects of pelvic irradiation of the ovum and of the fetus in utero. It is generally accepted that an ovum damaged by irradiation is incapable of subsequent fertilization. If this be true, as it would seem to be from experimental and clinical observations, there need be no concern for the fate of babies unconceived. But the fate of the fetus in utero is a matter of the utmost concern. Pelvic irradiation for therapeutic purposes, in the presence of an unsuspected pregnancy or when done for the relief of conditions known to complicate a recognized pregnancy, is a serious matter, as has been conclusively demonstrated by animal experimentation and by clinical observation. I think it is now generally accepted by all clinicians that therapeutic pelvic irradiation is fraught with the gravest danger of injury to the fetus. Murphy and Goldstein estimate the incidence of fetal deformities to be five times as great where the rays are applied to a pregnant uterus as in preconception irradiation; that greater damage to the fetus is sustained when irradiation is done in the early months of gestation. It appears that the central nervous system is peculiarly sensitive to influences of irradiation in its early development, and we find both in animal experiments and in clinical observations that irradiation of the early fetus results in such deformities as microcephalic idiocy, microcephaly, hydrocephalus and blindness. To add to the quota of deformities so often observed we find spina bifida, club feet, alopecia of the scalp, ossification defects of the skull, divergent squint and deformities of the upper extremities. The likelihood of such deformities occurring as the result of pelvic irradiation of the pregnant uterus in the first and possibly the second trimesters has led C. C. Norris to advise the interruption of pregnancy when it is disclosed that an unrecognized pregnant uterus has been irradiated for therapeutic purposes. We would go one step further in suggesting the advisability of an exploratory curettage preceding pelvic irradiation in the childbearing age as a precautionary measure.

Cancer of the cervix associated with pregnancy should be treated in the interests of the mother in the early stages of cancer. This calls for radical surgery. In the late stages the interest of the baby is the prime

consideration and radium therapy is the method of choice. Because of the very real danger of infection and of injury to the fetus, the uterus should be emptied before applying radium.

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DISCUSSION

DR. P. BROOKE BLAND, Philadelphia, Pa.—It is universally conceded, I believe, that irradiation is the most valuable agent used in gynecologic therapy, but it is not generally appreciated that of all the agents used, it is probably the most dangerous. In my early experience with the element I encountered all or nearly all of the complications enumerated by Dr. Findley and I am in complete accord with the statement that it is not always possible to prevent complications following radium treatment.

With respect to mortality following pelvic irradiation, one finds some discrepancy in available figures. In Europe the death rate is considerably higher than in this country. In France, owing probably to long exposure or heavy dosage, the mortality is in excess of 4 per cent. In a series of 2,548 cases collected from the literature, there were recorded 68 deaths, a mortality of 2.5 per cent.

DR. J. E. SADLIER, Poughkeepsie, N. Y.—I have been especially impressed with the fact that the serious complications happen largely with those who should not use the remedy, for instance the general practitioner or the surgeon or gynecologist who only occasionally makes use of it. With those who are in constant touch with this form of therapy, who understand and use it properly, although it is still a dangerous remedy, it does not carry with it that large number of complications.

DR. WALTER T. DANNREUTHER, New York City.—Any clinician who follows his pathologic and biopsy specimens to the laboratory will verify repeatedly the classical description of Ewing, written in 1917, of what happens in the tissues, particularly in the uterus, after radium has been applied. With a knowledge of these histopathologic changes, some of the subsequent events are easily explained. Within two to five days there is a tremendous local hyperemia; hence, there may be a temporary increase in bleeding in a certain number of cases after the application of radium; in others harboring a latent pelvic infection, an acute inflammatory recrudescence may occur. As the leucocytic and lymphocytic infiltration increases, the malignant cells degenerate, and their nuclei swell and disintegrate, forming pyknotic figures. As the autolytic process in the neoplasm goes on, there is a considerable increase in the nitrogenous waste products added to the blood; Dr. Schmitz has shown it to be about 20 per cent. This is one reason why the patient with an advanced stage of malignant disease, especially if the cardiorenal system is seriously impaired, is not a candidate for heavy irradiation. Within three or four weeks there is definite fibroplastic proliferation, and finally epithelialization and repair. After overdosage of radium or x-ray, there is bound to be excessive fibrous tissue formation, with consequent pelvic pain, strangulation of ureters, etc.

The most serious complication following radium therapy is an acute pelvic peritonitis. I would go a little further than Dr. Findley and stress the importance of determining the presence of a latent salpingitis, and treating it as a preliminary precaution. In three cases coming under my observation, two of which were my own, the peritonitis seemed to be characterized by a sudden onset within twenty-four hours, with a rapid rise of temperature and acute pelvic pain. The patient dies within four days or else is well on the way to recovery.

An important complication which has not been mentioned is a secondary intestinal obstruction or necrosis. Pemberton, Keene and others have reported instances of both these conditions some months after the application of radium in patients in whom there was a loop of intestine adherent in the pelvis at the time of the treatment. Caution should be exercised in treating any patient with radium who has a scar in the lower abdomen, particularly if she has a history of preexisting pelvic inflammation.

The secondary cystitis and bladder ulceration that occur occasionally can sometimes be fairly attributed to the radium, but the danger of these accidents will be minimized if the anterior and posterior vaginal fornices are stuffed with gauze to the point of extreme distention.

In many patients who have been given an overdose of radium or x-ray for benign as well as malignant conditions, there will be a persistent pelvic discomfort, or even continuous pain, caused by excessive fibrosis. Unduly prolonged applications of inadequate quantities of radium for benign conditions, especially if insufficiently screened, are apt to excite pelvic discomfort, which subsequent hysterectomy will not completely relieve.

DR. WILLIAM SCOTT, TORONTO, ONT.—This is exceedingly opportune in Canada. There have been several commercial institutions renting radium, with a widespread advertising campaign. And along with that the suggestion is being put forth that the Government should supply radium to the general practitioner at his request. That carries with it all of the dangers that we have heard enumerated but also the further danger of inadequate treatment. The local disappearance of a tumor only too frequently is accepted by the operator as a criterion of cure, although in many cases this is anything but a permanent cure.

If we are to treat adequately cancer of the cervix with radium, we will have complications and some mortality. Both complications and mortality should be lower than they were when radical surgery alone was used, but some of those complications mentioned this morning are inevitable. The old gonococcal inflammation is sometimes encountered with cancer of the cervix, and if we are agreed that radium offers a better hope than does surgery we must eventually treat that patient. It is quite true that she must have rest and a preoperative regime, but even then we run the definite danger that this infection is going to light up. I think that we should treat these patients with radium and not surgery and treat them in the full expectation that some of them are going to be seriously ill and there is going to be some mortality. The same thing applies to a lesser degree with some of the fistulas that develop. A patient who presents herself at our clinic with well-advanced cancer, even if we are reasonably certain that there is a close approximation at the outer edge of that growth and the bladder wall, is, at least, entitled to the chances of palliation if not a permanent cure.

For eight years all cases of cancer of the cervix at the Toronto General Hospital in the public wards have been treated with radium and not with surgery, an average of between 40 and 50 cases a year, and we have yet to have a primary death.

DR. A. P. LEIGHTON, PORTLAND, ME.—Improper filtration is responsible for a great number of complications. I believe that a small amount of radium used over a long period of time with proper filtration is the correct set-up for the treatment of uterine carcinoma.

I believe, too, that platinum is the proper filter, inasmuch as it is three or four times denser than brass which is so commonly used. The use of platinum and gold minimizes the danger in the use of radium, obviates the necessity for caustic effects, absolutely filters off the Beta rays or allows for its prolonged use without deleterious effects on the adjacent tissues.

I cover my tubes with an aluminum foil and encase this in a dead end rubber intrauterine tube. I have yet to see any poor results following this type of set-up.

I believe that the commercial use of radium or radium emanation is almost criminal in some cases. Overirradiation is the result in some cases and insufficient irradiation more often in others.

The selection of cases for radium therapy is most important, therefore, I find myself avoiding some of the Group III and IV cases unless I make it emphatic to the patient beforehand that she may expect only temporary results. The loss of a patient of the Group III or IV Class, which is to be expected, does a great deal of harm to the cause of radium. Groups I and II allow for the best results and it is to people with carcinoma so grouped that we may expect cures, and where radium comes into its own.

DR. HENRY SCHMITZ, CHICAGO, ILL.—Complications of the urinary tract are the most frequent whether the carcinoma remains untreated or is treated by surgery or irradiation. We know that the average occurrence of urinary fistulas is about 12 per cent, of rectal fistulas 6 per cent, and of rectovesicovaginal fistulas about 3 per cent. The primary and early complications in the urinary tract can be prevented, while the late complications, probably in the majority of cases, are due to the primary carcinoma. The latter may have been temporarily arrested, yet the complications in the urinary tract may follow. The simplest means to prevent these complications is cystoscopic examinations. An irregularity of the posterior bladder wall, either due to an infiltration of the vesicovaginal septum or edema or even of ulceration by the carcinoma, contraindicates the use of radium in the vaginal or cervical canal. If radium is used in spite of these findings, complications in the urinary tract are apt to follow.

These complications in the urinary tract may be divided into those of the lower and those of the upper region. They may occur early or late. The former are radiation cystitis which is temporary and easily treated, and the fistulas due to the breakdown of the carcinoma in the vesicovaginal septum. The late complications may occur several years afterward and are the latent radiation ulcers. Complications in the upper urinary tract involve the ureter and the kidneys and are due to a compression of the ureter by connective tissue scar formation or by an extension of the carcinoma. Depending on the presence or absence of the infection, there will be found hydroureter, hydronephrosis or pyonephrosis. By a careful cystoscopic examination the absence of any possible infection or invasion of the vesicovaginal septum can be determined and irradiation should be refused and complication in the urinary tract will not occur.

DR. JAMES E. KING, BUFFALO, N. Y.—It seems to me in discussing the treatment of carcinoma by radium we should consider the two types of cases that we are called upon to see, one where some palliative measure only is undertaken, and the other where a cure is possible. I find that it is much more dangerous so far as fistulas are concerned to overirradiate Types 3 and 4 than it is in the earlier cases.

I agree with what Dr. Schmitz has said, that we had better leave many of these advanced cases untreated for the sake of the reputation of radium as well as for our own reputation. It is very difficult in these advanced cases, having hemorrhage and foul discharge, not to attempt to do something for them.

I have also had one case in which the finger could almost be passed into the bladder and, much to my surprise and satisfaction, after several months this fistula healed. I have also had one fistula of the ureter which was demonstrated without question. This also healed and the patient now is alive after three years with no indication of kidney destruction.

THE CHEMICAL MECHANISM OF LIVER PROTECTION IN ABDOMINAL SURGERY*

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PROBABLY every surgeon has had a mortality after a laparotomy where the mechanism of death was uncertain and inexplicable. To stand at the foot of the patient's bed and see the individual in coma following a comparatively simple laparotomy, without any element of sepsis, or any preexisting kidney lesions, is an experience fortunately rare but nevertheless constantly recurring in large surgical services. If one surveys the causes of death after laparotomy one is impressed with the regularity with which the lethal factor falls into well-defined postoperative categories. It has been our experience that a death certified as due to uremia is a relatively infrequent occurrence. Within the first twenty-four hours after laparotomy sudden death may usually be attributed to mechanical factors, such as embolism, hemorrhage, gastric dilatation, and the more grave myocardial lesions. After the first twenty-four hours pneumonia, in any one of its varieties, is probably the largest postoperative contributory factor in the production of death, while peritonitis usually makes its appearance after the first forty-eight hours.

In reviewing the mortalities of our laparotomies in 1922 with particular reference to the part played by the liver, we were impressed with three types. There is a type of mortality, after gallbladder and liver surgery that, while numerically infrequent, occurs from time to time and which is inexplicable upon any of the ordinary accepted mechanisms of death. In general three types of postoperative liver deaths may be considered. For convenience these may be synoptically grouped as follows: (a) those with hyperpyrexia and coma; (b) those with a cholemic state in the presence of a diminishing jaundice, and (c) those associated with marked cardiovascular asthenia and pronounced renal failure. From our studies we were led to believe that in some way the mechanism in the production of these types of mortalities was in some way referable either to failure of liver function or to an insufficiency in liver protection.

The liver is a most complete and yet a most individualized chemical laboratory. Its functions are so diverse, its physiologic response usually so adequate that up to date, except in extreme or marked cases of liver

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disease, we have no competent laboratory tests that will indicate either the relative or absolute degree of actual liver function present in a patient before operation. So far as protein metabolism is concerned, the liver receives the entire protein content that is absorbed from the gastro-intestinal tract. Protein material is broken down by a process of deaminization into simpler amino bodies and prepared for eventual elimination by the kidney in the form of urea with small amounts of uric acid and creatinine. So far as sugar metabolism is concerned, the entire alimentary sugar content is stored in the liver cells and liberated as dextrose in response to stimuli from the body cells. In regard to fat metabolism, it seems more than probable that the final metabolism of fat is in a large measure the function of the hepatic cells. When we consider the rôle played by the liver, either as a secretory or excretory organ, we note (a) its function in the production and elimination of bile; (b) its control of the maintenance of blood sugar level, heat production and heat distribution; (c) its occult function in blood clotting and control of bleeding. The liver possesses in remarkable degree the property of regeneration, and it has been possible on experimental animals to remove 80 per cent of the liver substance without the production of jaundice or with any manifest failure of liver function, for 75 per cent of the liver in rats may be extirpated with complete regeneration within six to eight weeks. The liver, however, does not hypertrophy by cellular enlargements as the result of work or over function, and probably at all times exhibits some areas of degeneration sequential to abdominal infection or enterogenic toxins. These areas of degeneration are replaced by fibrous tissue, while the normal quantitative degree of liver function is maintained by the process of hyperplasia and regeneration. Adami has indicated that the liver possesses, in a surprising degree, the property of destroying bacteria and rendering innocuous certain chemical and biotic toxins, and Opie has shown the high resistance of the liver cells to infection with coli bacteria, as well as the ease with which the liver is infected by the same coli bacteria when the liver cell is injured by alcohol or enterogenic toxins.

It would seem a wise procedure in all laparotomies for the surgeon to palpate the liver. We have been impressed with the postoperative disabilities of patients who have a small or atrophic liver. On the other hand, there are numerous individuals who are operated upon for pelvic conditions who have small atrophic types of liver. It has appeared that these individuals respond less readily to abdominal operations than others with an apparently normal bulk of liver substance. Inferentially, it may be predicated that the liver response to surgery is in some way proportional to its normal bulk and the operator may many times anticipate and be forewarned by a palpatory estimation of liver bulk during the course of a laparotomy. Moreover, the marked liver degeneration seen in eclampsia and in the toxemia of pregnancy, serves to

indicate the tremendous lethal effect of body toxins when produced in disturbed conditions of body chemistry.

In the course of twenty-four hours the sum total of all of the digestive secretions, plus the fluid intake, together with the intestinal secretions, varies from 7,500 c.c. to 10,000 c.c. This enterohepatic water circulation is fundamental and essential for the maintenance of life. According to Orr a loss of 40 per cent of body protein, fat, and sugar may occur without death, but a water loss of 10 per cent is dangerous and a loss of 20 to 22 per cent of body fluids occasions death.

Vomiting which is prolonged or recurrent entails a tremendous loss of body fluid and disturbs the water balance of the body. With repeated vomiting there is a corresponding loss in blood chlorides. Therefore the chemical result of pronounced loss of water and chlorides is the establishment of a vicious circle with death-producing mechanisms: (a) dehydration and (b) hypochloremia. The disturbance in the enterohepatic water circulation may invoke either acidosis or alkalosis. According to Cutting alkalosis may be suspected when there is (1) dehydration, (2) blood concentration shown by increase of red cells and hemoglobin, (3) nausea and vomiting, (4) low blood pressure, (5) marked asthenia, (6) increase of blood nonprotein nitrogen, urea, and creatinine, (7) albumin and casts in urine. Acidosis may be suspected when there is (1) drowsiness and sluggishness, (2) irritability, (3) hyperpnea, (4) nausea and vomiting, (5) headache, (6) abdominal pain, (7) dehydration, (8) low urinary output, (9) cyanotic or cherry red lips, (10) convulsions, (11) coma.

As a laboratory test to aid in estimating the possible protective functions exercised by the liver we have utilized the following:

a. In the presence of jaundice:
   1. The icteric index.
   2. The van den Bergh reaction.
   3. (Occasionally) the Fouchet reaction.
   4. The test for urobilinuria.

b. With or without the presence of jaundice:
   1. The galactose test.
   2. The urobilinuria test.
   3. The cholesterol determinations.

Our preoperative and postoperative regimen has been based upon two specific postulates: (1) the maintenance of complete and full water balance; (2) to increase the glycogen reservoir function of the liver.

We believe it is necessary before and after operation to maintain a fluid intake of not less than 3,000 c.c. a day. This may be accomplished by (a) the forced fluid intake by mouth, of water, ginger ale, lemonade, orangeade, or tea, with excess sweetening with dextrose: (b) by proctoclysis, using tap water with 10 per cent glucose, 500 c.c. every eight hours; (c) giving intravenously 800 c.c. to 1,000 c.c. of

normal saline, with or without the addition of 5 to 10 per cent of dextrose. It is well to remember that a damaged liver can handle carbohydrates with relatively less difficulty than the same liver can handle protein. Animals with obstructive jaundice usually die in a few weeks, but Mann was able to keep them alive from seven to eight months on an almost complete carbohydrate diet. Feeding these same animals with meat usually killed them.

For forty-eight hours before operation, irrespective of the weight and size, or sugar tolerance of the individual, we attempt to give a diet made up predominantly of carbohydrates. The ready protection afforded by insulin minimizes the possibility of overcharging of the blood stream with sugar. If the patient is jaundiced, determinations of both bleeding and coagulation time are made. Where the coagulation time indicates delay we have recourse to the intravenous administration of 10 c.c. of 5 per cent sterile solution of calcium chloride once daily for two days before operation. Transfusion before operation is of infinitely more value than after operation or after the onset of postoperative bleeding. If the patient before operation has been vomiting and blood chemistry indicates a fall in chlorides ,we give 200 c.c. of 2 per cent sterile solution of sodium chloride intravenously.

The postoperative treatment demands more nursing and administrative detail. After all laparotomies there is an absorption of normal or altered blood serum, pathologic exudates and the by-products of a deranged gastrointestinal system. The absorption of any great amount of wound serum means an increased burden on the part of the liver. Wound serum is essentially protein material which must be metabolized by the liver after absorption. In all laparotomies there are varying degrees of peritoneal denudation and particularly after certain pelvic operations. In all these cases there is peritoneal transudation and some wound secretion. Drainage is indicated in these cases, not alone to prevent the development of sepsis but also to allow for external drainage of the accumulated wound secretions which might otherwise embarrass an already overburdened liver. Experimentally, it has been demonstrated that the injection into the circulation of the secretion from any large intraperitoneal wound is injurious to the hepatic parenchyma and the effect of such injections can be chemically estimated by a decreased output of bile acids and bile salts. The most beneficial technical detail is to aspirate as much fluid in the operative field as is possible and to plan the surgical procedures so as to leave a minimal amount of abraded or denuded peritoneal surfaces. In this regard it appears wiser also after a cholecystectomy not to suture the two edges of the gallbladder fossa together as the ability of the liver to exudate hepatic serum for absorption by the peritoneal lymphatics means a lessening of the load imposed upon the liver itself.

In the postoperative treatment, if vomiting occurs, complete and absolute deflation of the stomach is accomplished by the introduction of an indwelling Levine nasal tube and everything by mouth contraindicated, fluids and sugar being introduced intravenously, hypodermatically, or by proctoclysis. Hypochloremia is particularly to be guarded against as a postoperative condition as the vomiting that sometimes follows operations on the ovaries is of persistent type characterized by loss of large amounts of upper intestinal fluid and chlorides. A very simple test determines the evacuating capacity of the stomach. At a certain hour 8 ounces of water are given by mouth, the patient drinking it freely; the Levine tube is clamped off and after an hour the contents of the stomach aspirated. If more fluid is obtained by aspiration than is given, it is obvious that the stomach is not emptying but is adding to its contents by regurgitation. If the quantity obtained by aspiration is less than that given, then the stomach is evacuating some portion of the fluid given. During the time the Levine tube is in place the patient may drink water and so allay the sensory and subjective sensations of thirst without endangering gastric tranquillity, as the fluid ingested is immediately drained back into the bottle by means of the Levine tube. The Levine tube is kept in the stomach until definite improvement occurs when the tube may be utilized for the purpose of fluid replacement by connecting a Murphy drip apparatus to the Levine tube, giving as high as 5 per cent glucose solution by the drop method.

Of great importance is the care that is exercised in the selection of an anesthesia. The dangers of liver degeneration from chloroform are so thoroughly understood, and the fact that chloroform is used so infrequently in the United States as a general anesthesia, has largely removed the possibility of danger from this source. Anesthetics that produce anesthesia by rectal or colonic administration carry with them the possibility of disturbing normal liver physiology as most of the anesthetics of this type must be disposed of and finally eliminated by the agency of the liver. Spinal anesthesia has a relatively large table mortality but does not add any additional trauma to the liver. Ethylene gas anesthesia, plus local anesthesia, or even with the addition of small quantities of ether, in our opinion, seems to be the safest of all types of anesthesia. It is our impression that in our mortalities anesthesia per se has not been a contributing factor of much importance.

The conclusions are: (1) routine examination of the patient before laparotomy for the purpose of ascertaining adequate liver protection; (2) maintenance of normal water balance and blood chlorides; (3) protection of liver function by increasing glycogen storage function of the liver; (4) control of hemorrhage by transfusion and intravenous calcium chloride, preferably before operation; (5) the lessening of liver trauma by high carbohydrate diet and efforts at intestinal antisepsis by enema and colonic irrigations, cathartics as a rule being contrain-

dicated; (6) routine carbon dioxide blood determinations are of great value, indicating either a move to the right into the alkalosis type or a move to the left into the acidosis type.

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DISCUSSION

DR. W. WAYNE BABCOCK, Philadelphia, Pa.—At the same time that we have been developing measures to protect the liver, we have devised many diagnostic methods some of which damage the liver. A liver that has just been subjected to the x-ray, to starvation, and to various toxic dyes in an effort to determine a diagnosis is not a liver that is best adapted to sustain the ill effects of an operative procedure, and an ill patient who has been through an elaborate diagnostic regimen should be given a chance to recuperate from these diagnostic procedures before the operation is undertaken. With a normal liver this may not be so important but with one damaged by disease these things have to be considered. It is also to be remembered that many of the toxic drugs, as morphine and strychnine, have to be detoxicated by the liver, an additional burden.

The time of operation may be important in acute cholecystitis. Cholecystectomy for subacute or chronic conditions has a mortality perhaps less than 1 or 2 per cent but where there is an acute infected gallbladder, an acute purulent or gangrenous cholecystitis, the mortality is much higher. The general plan has been to advise procrastination until the patient is well over the acute attack. In about 50 cases we compared the effects of delay. All that were operated upon before the ninth day recovered. The mortality in those operated upon after the ninth day was very high.

The type of operation was apparently less important. From 24 cholecystectomies done upon patients in the earlier stage of the disease, or where the general condition was more promising, there was no death. The remaining patients who had a simple cholecystostomy, because the disease was advanced had a mortality of 45.2 per cent although we did the simplest type of operation and protected the patient in every way we knew how.

The conclusion is that if a patient with acute purulent or gangrenous cholecystitis has been held over nine days, it is perhaps best to delay operation, but during the first nine days of the disease to operate promptly. If the patient is in fair condition and seen early, cholecystectomy can usually be done without increasing the mortality. Patients of this type usually have a stone impacted in the neck of the gallbladder, and the diagnosis is readily made by the prolongation of the biliary colic, without jaundice but with a large palpable gallbladder.

In cases of jaundice, as has been described, we depend largely upon injections of calcium, of questionable value, and especially blood transfusions. A damaged liver, however, may not respond well to a transfusion reaction. In jaundice early operation is preferable to delayed operation. The danger of fatal hemorrhage in prolonged jaundice is always great, and we have no very effective measures for combating it. We should encourage physicians to send patients early for diagnosis

and treatment. Very often a stage operation will offer the patient the best chance of recovery; in other words, a cholecystostomy with a slow decompression of the biliary system, and later the removal of the obstruction.

The hand of the beginner is heavy in operating upon the biliary tract, and it seems that many of us cannot develop a safe technic until we have damaged the common duct in one or more patients. Less often the hepatic artery or portal vein has been wounded. As cholecystectomy has become popular more and more biliary fistulas require closure. If the fistula has been present for a long period of time. these patients need careful preparation with administration of water, salts, and glucose, and perhaps aspiration of the bile from the fistula and its return to the intestinal tract through a duodenal tube.

DR. F. E. SONDERN, NEW YORK CITY.—From the clinical pathologist's point of view our work in the type of cases under discussion is in many instances definitely helpful in a diagnostic way. It often confirms and substantiates the clinical findings, in fact most of the clinical pathologic work that has to do with the cases described is really more confirmatory than actually diagnostic.

The tests and procedures that Dr. Heyd mentioned are the more useful ones, but the ones that I had in mind and thought that he was going to describe are the functional tests. Laboratory consultants are often distressed when asked to use some of the procedures in these very ill patients for the determination of functional ability. Some of these tests are definitely dangerous to use at the time of the serious stage of the disease of which Dr. Heyd speaks, and I would like to voice caution in the use of these functional tests particularly at that time simply to verify certain conditions. The possible action on the patient of functional liver tests at any time should be well considered before they are used.

DR. J. W. KENNEDY, PHILADELPHIA, PA.—Given any dysfunction of the liver, which may be existing at the time of operation and not recognized: Is it not possible that such dysfunction of the liver will prevent the proper metabolic disposition of the protein material which is incident to any abdominal operation? This break in the normal metabolic change may after all be the cause of the toxemia which may be the true etiology in these unaccounted-for deaths.

I have made this observation a great many times. In any extensively drained abdominal cavity by gauze, I have never seen this type of death. It is possible that these unexpected deaths may be due to a toxemia which begins in the reactions of the peritoneum to the absorption of products which are incident to abdominal surgery and end with a dysfunction of the liver.

DR. JAMES E. DAVIS, ANN ARBOR, MICHIGAN.—There is a group of cases seen at the autopsy table that present a picture something of this character: There is a definite increase in the stiffness of the organs, especially of the liver. Microscopically one finds a generalized arteriosclerosis present and critical examination does not show that the liver parenchyma has been unduly reduced or the stroma relatively increased over what could be found in any other organs. In this group of cases it may be noticed that sudden death after an operation is a common occurrence. Under the influence of Dr. Heyd's teaching, clinicians have ascribed the reason for the sudden death to liver pathology, but autopsy studies fail to prove this view, because there is a sufficient amount of liver parenchyma remaining to carry on normal function. In the cases where the icterus index is increased, where it is sustained above 15, where one can see with the microscope the definite storage of bile pigment, especially around the central veins, and the patients are over fifty years of age, very frequently sudden deaths follow operations.

A point of particular interest in surgery is that, when the abdomen is opened and all of the organs are definitely stiffened, one should be very careful in not pro-

longing the anesthesia, and the utmost attention should be given to watching blood loss as these cases are apt to collapse suddenly not from liver pathology alone but from multiple organ arteriosclerosis.

DR. HEYD (closing).—It is a matter of great importance whether the liver is competent. We have all seen mortalities following laparotomy in individuals that under ordinary circumstances would be considered exceptionally good surgical risks. We watched these patients die, handicapped by not knowing what to do. For example, a female patient is operated upon at 9:00 A.M.; has a simple cholecystectomy under ether anesthesia; at 2:00 P.M. instead of being out of her anesthetic, the patient is somnolent; at 6:00 P.M. she has a temperature of 102°, at 9:00 P.M. 103°, toward morning it reaches 105°, coma intervenes, and death follows. The vital factors that existed in this patient before operation certainly continued after operation, but some vital factor failed or was interrupted. I desired to bring out in my paper certain general principles: that the absorption of serum is inimical to the well-being of the patient, whether that serum is in the pelvis or in the right upper quadrant.

The next point was that no individual could sustain the prolonged loss of body fluid and survive. An individual may lose 40 per cent of carbohydrates, fats, or proteins, but a loss of 20 per cent in body fluid is lethal. Furthermore, persistent vomiting means dehydration and loss of chlorides. A vicious circle is thus initiated for with continuous loss of fluids and chlorides by vomiting, alkalosis becomes imminent. Sodium bicarbonate has no place in postoperative therapy in individuals threatened with alkalosis. The intravenous administration of 200 c.c. of a 2 or 4 per cent sodium chloride solution acts almost magically, especially if the patient is adequately treated for dehydration. Finally, many of these patients may be saved a severe postoperative course if the surgeon makes a palpatory examination of the liver during the operation, for it is a strong conviction upon our part that hepatic competency is proportional to normal liver bulk.

SOME OBSERVATIONS ON STRICTURE OF THE FEMALE URETHRA*

H. M. N. WYNNE, M.D., MINNEAPOLIS, MINN.

TWELVE years ago I had the opportunity of examining a woman fifty-nine years of age in whom the end-results of a stricture of small caliber were well illustrated. The story began some twenty years before, when she noticed that it took longer to empty her bladder and that she voided a smaller stream. Two years before I saw her she had symptoms of progressing renal insufficiency. Complete urinary retention brought a crisis some months before I saw her. Catheterization was instituted and her condition improved. She lived in comparative comfort the following three years and then died. Cystoscopic studies showed two strictures of the urethra, dilatation and hypertrophy of the bladder, enormous dilatation of the ureters, and large infected hydronephroses.

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At the time I reported this case twelve years ago, I was under the impression that stricture of the urethra in women was rare and I still believe that a stricture of small caliber is an uncommon lesion.

Dr. Guy L. Hunner called my attention to his finding stricture of the urethra in 85 per cent of a hundred consecutive cases of ureter stricture. He refers to stricture due to senile change, to focal infections and following gonorrhea. The most common site in his experience is in the posterior third of the urethra. Hunner has found definite stricture in some instances without symptoms. William E. Stevens states that stricture in the lumen of the urethra is uncommon but that congenital or acquired obstructions occur with great frequency at or just within the meatus. He finds gonorrhea the most common cause. Pugh's experience agrees with that of Stevens. Bugbee found 41 strictures in a series of 1,000 women who complained of urinary frequency. Nisbett considers strictures of large caliber common. Boyd believes that congenital stricture of the meatus is a common cause of pyelocystitis in female infants and children. King reports only four cases seen in a dispensary experience of ten years. He finds after reviewing the literature, that malignant tumors are the etiologic factor in a considerable proportion of cases. King does not believe that the so-called soft strictures should be classified as strictures. Vilfroy states that stricture in women is rare and is usually found at the meatus or sphincter and that gonorrhea is usually the cause. Kelly, Kidd, Osgood and others consider stricture uncommon in women.

It is evident that all urologists do not agree on the clinical signs of stricture. I believe that the pathologic specimens of urethral stricture in women are few and that practically all reported are small caliber strictures. Therefore we have little pathologic evidence of the exact lesion represented by our clinical findings of large caliber strictures and of the so-called soft strictures. However, for the purposes of discussion we shall consider any obstruction to the passage of a sound that will pass the meatus as a clinical stricture except a tumor, stone or other foreign body. Obstructions due to scar tissue not involving the urethral walls are not strictures although the symptoms are similar. Whether stricture at the meatus is to be judged merely by the size of the orifice is a moot question. Obstruction to the passage of a sound may be due to tumors or inflammations of the tissues surrounding the urethra. Scars following trauma or ulceration of the anterior vaginal wall may also constrict the urethra from without. Edema, inflammatory infiltrations, scar tissue and neoplasms are abnormalities of the urethra which may cause clinical signs and symptoms of stricture. In the vast majority of these cases our knowledge is limited to impressions derived from the passage of sounds, bulb bougies or catheters and to the urethroscopic picture.

It is usually stated by anatomists and urologists that the meatus is the smallest caliber of any portion of the urethra. Therefore it is of importance to determine, if possible, what the normal size of the meatus is and whether an obstruction to a sound that passes the meatus is to be considered a stricture.

Herman measured the urethra of 55 women who had no urinary symptoms. He used Hegar dilators for this purpose. He could not determine that age or child-bearing had any influence on the size of the urethra. His results are as follows:

SIZE OF HEGAR DILATOR	NUMBER OF CASES
7	2
8	11
9	21
10	15
11	6
12	1

Van-de-Warker measured the urethra of 105 women using bulb bougies. He stated that it is rare to find a woman who has never had any urinary distress. His results were as follows:

SIZE OF BULB FRENCH SCALE	NUMBER OF CASES
23	20
24	18
25	24
26	9
27	18
28	16

None were larger than 29 F. except in diseased conditions.

Van-de-Warker found the most common stricture an annular stricture of the meatus and rarely encountered close to but not involving the meatus. Eversion of the urethral mucous membrane at the meatus he believed due to an annular stricture of the meatus and cured this condition by dilatations without difficulty.

Stevens measured the urethra of eighteen women who had had no urinary symptoms and apparently considered 26 F. and above the normal size of the meatus and less than 26 F. congenital or acquired stricture. Pugh reported 35 strictures that measured less than 18 F. and 114 that averaged 22 F. apparently had lesions. Bugbee found 41 strictures in a series of 1,000 women who had urinary frequency. He included only such cases as it was difficult to pass an 18 F. sound. Pasteau passed sounds on cadavers and decided that the average normal meatus is 24 F. Others have given 18 to 24 F. (Cruveilher), 20 to 22 F. (Sappey), and 21 F. (Henle) as the normal size of the female urethra.

The measurements made by the various investigators are evidence that the normal meatus measures from 18 to 30 F. and the majority are from 23 to 30 F. The finding of so many strictures at the meatus (Van-de-Warker, Stevens, Pugh) suggests that some observers consider the "ring" type meatus as a stricture if it is of a caliber less than the average. I am not convinced that a "ring" type meatus should be considered as a stricture even when small unless there is other evidence. It is a simple matter to excise a small wedge of the posterior portion for microscopic sections and at the same time effect a cure if the size of the meatus is the cause of the symptoms. In my series of measurements the "ring" type meatus was present in more than half. There

TABLE I. MEASUREMENTS OF THE URETHRAL MEATUS WITH METAL BULB BOUGIES WITHOUT ANESTHESIA, IN 108 WOMEN WHO HAD NEVER HAD ANY URINARY SYMPTOMS*

SIZE OF BULB F.	DURING MENSTRUAL LIFE				AFTER MENOPAUSE				TOTAL MARRIED AND SINGLE
	MARRIED	PAROUS	SINGLE	TOTAL	MARRIED	PAROUS	SINGLE	TOTAL	
20	3	2	1	4	0	0	1	1	5
21	2	2	0	2	0	0	0	0	2
22	3	2	6	9	2	1	0	2	11
23	3	3	0	3	0	0	0	0	3
24	8	4	3	11	1	0	0	1	12
25	7	6	4	11	2	2	1	3	14
26	8	2	4	12	1	1	0	1	13
27	5	4	1	6	1	0	0	1	7
28	3	3	1	4	2	1	0	2	6
29	5	3	2	7	1	1	0	1	8
30 and over	20	8	7	27	0	0	0	0	27
Total	67	39	29	96	10	6	2	12	108

*In this and subsequent tables we have made a "parous" subdivision of the "married" columns. This subdivision shows the number of married women who had had full-term labors. The first column under "married" shows the total number of married women.

were 19 of the "ring" type less than 24 F. who had never had any urinary disturbance. I have recently measured the meatus in 206 women during the course of pelvic examination. These measurements were made with metal bulb bougies without any anesthesia. The largest bulb passed without splitting the meatus is the measurement recorded. In my experience the application of cocaine or other local anesthetic relaxes the meatus sufficiently to allow one or two sizes (F.) larger to

TABLE II. MEASUREMENTS OF THE URETHRAL MEATUS WITH METAL BULB BOUGIES WITHOUT ANESTHESIA OF 97 WOMEN WHO HAD HAD SOME SYMPTOMS REFERABLE TO THE URINARY TRACT

SIZE OF BULB F.	DURING MENSTRUAL LIFE				AFTER MENOPAUSE				TOTAL MARRIED AND SINGLE
	MARRIED	PAROUS	SINGLE	TOTAL	MARRIED	PAROUS	SINGLE	TOTAL	
18	1	0	0	1	1	1	0	1	2
19	0	0	0	0	1	1	0	1	1
20	1	0	1	2	0	0	0	0	2
21	4	2	0	4	3	2	0	3	7
22	5	1	1	6	0	0	0	0	6
23	0	0	0	0	0	0	0	0	0
24	6	0	4	10	0	0	0	0	10
25	3	2	6	9	2	2	0	2	11
26	9	2	2	11	3	2	0	3	14
27	3	2	5	8	1	1	0	1	9
28	4	4	1	5	1	0	0	1	6
29	2	1	1	3	1	1	0	1	4
30 and over	16	10	8	24	1	1	0	1	25
Total	54	24	29	83	14	11	0	14	97

TABLE III. MEASUREMENTS OF THE URETHRAL MEATUS WITH METAL BULB BOUGIES WITHOUT ANESTHESIA. TABULATION ACCORDING TO THE TYPE OF MEATUS

SIZE OF MEATUS	"RING" TYPE							"NORMAL" TYPE							"RING" AND "NORMAL" TYPES		
	MARRIED				SINGLE			MARRIED				SINGLE					
	WITH SYMPTOMS	PAROUS	WITHOUT SYMPTOMS	PAROUS	WITH SYMPTOMS	WITHOUT SYMPTOMS	TOTAL "RING" TYPE	WITH SYMPTOMS	PAROUS	WITHOUT SYMPTOMS	PAROUS	WITH SYMPTOMS	WITHOUT SYMPTOMS	TOTAL "NORMAL" TYPE	TOTAL WITHOUT SYMPTOMS	TOTAL WITH SYMPTOMS	TOTAL OF ALL TYPES
18	3	1	1	0	0	0	4	0	0	0	0	0	0	0	1	3	4
19	2	1	0	0	0	0	2	0	0	0	0	0	0	0	0	2	2
20	0	0	3	1	1	2	6	1	0	1	1	0	0	2	6	2	8
21	6	4	3	2	1	0	10	0	0	0	0	0	0	0	3	7	10
22	4	3	3	2	1	5	13	1	0	2	1	1	1	5	11	7	18
23	0	0	2	2	0	0	2	0	0	1	1	0	0	1	3	0	3
24	4	1	5	5	1	3	13	2	0	1	1	3	2	8	11	10	21
25	3	3	3	3	3	3	12	1	1	7	5	4	1	13	14	11	25
26	8	3	8	3	3	1	20	2	1	1	0	0	3	6	13	13	26
27	2	2	2	2	2	0	6	1	1	3	2	2	1	7	6	7	13
28	3	1	2	2	0	0	5	3	3	4	2	1	1	9	7	7	14
29	2	1	2	2	0	3	7	1	1	1	1	1	2	5	8	4	12
30 and over	5	4	3	1	0	1	9	11	7	17	7	8	6	42	27	24	51
Total	42	24	37	25	12	18	109	23	14	38	21	20	17	98	110	97	207

pass without evident injury than when the measurements are made without anesthesia. I have taken considerable pains to question these women about any past or present urinary symptoms. In the majority the bulb was passed into the bladder. I find that the bulb bougie causes considerably more discomfort to the patient especially at the sphincter region than does a smooth sound such as the rounded-end Hegar dilator. Where the meatus is smaller or less dilatable than the urethral lumen immediately behind it, there appears a distinct ring of tissue as the bulb dilates the meatus on withdrawal, and I have labeled such a meatus as a "ring" type. In certain instances the meatus is larger than the lumen of the urethra and no ring appears on withdrawal of the bulb. This type of meatus may have been split at some time but there was no evidence of such injury at the time of examination, except in two cases. I have not measured a sufficient number of strictures with the bulb bougie to have a practical opinion of the value of the "hang on withdrawal" as a means of determining the location of the narrowing but doubt if it is any more accurate than the "obstruction to entrance" of the Hegar dilator. In almost half of my patients there was no ring on the withdrawal of the largest bulb I was able to introduce through the meatus. I have labeled this type "normal" to differentiate it from the "ring" type.

I have also measured the urethra in 172 women who have complained of urinary tract symptoms. Table IV shows the size of the meatus as calibrated with Hegar dilators after the application of cocaine or neothesin for anesthesia. In these women the measurements were made by starting with the small sizes and continuing up to the largest size that would pass the meatus without injury. This method is less accurate than that made with bulb bougies, as the Hegar dilators are numbered according to their diameters in millimeters. It is doubtful whether the method used in these cases is any less accurate than

TABLE IV. MEASUREMENTS OF THE URETHRAL MEATUS WITH HEGAR DILATORS AFTER ANESTHESIA WITH COCAINE OR NEOTHESIN. ALL THESE PATIENTS HAD SOME URINARY TRACT DISEASE

SIZE OF HEGAR	DURING MENSTRUAL LIFE			AFTER MENOPAUSE			TOTAL ALL CASES	NUMBER HAVING INFECTED URINE
	MARRIED	SINGLE	TOTAL	MARRIED	SINGLE	TOTAL		
6	1	0	1	0	0	0	1	1
7	3	7	10	6	1	7	17	4
8	24	12	36	10	0	10	46	28
9	24	13	37	7	1	8	45	33
10 and over	34	16	50	11	2	13	63	37
Total	86	48	134	34	4	38	172	103

when one begins with the largest size of dilator and tries successively smaller sounds until one passes the meatus without injury (as was done by Herman).

In 36 women I have found an area of narrowing which was apparently abnormal and in those that occurred above the meatus the narrowing was of smaller diameter than the meatus. In none of these women was the obstruction due to tumor, stone, or other foreign body.

One of these women had acute retention and her physician was unable to pass a catheter. The obstruction was due to a suburethral abscess which was drained and complete relief obtained. I examined this patient two and a half years later and found no evidence of stricture although her urethra was small (18 F.).

Of 35 women 27 were married and 8 were single. Fifteen had had one or more children and 20 had never been pregnant.

Age	9½	18	20-29	30-39	40-49	50-59
Number	1	1	11	9	6	7

Etiology.—In 8 women the symptoms followed gonorrheal urethritis. Pregnancy was followed by symptoms in four. One of these had had the anterior two-thirds of the urethra destroyed and a scar tissue stricture was visible at the sphincter. Another had a transverse scar in the anterior vaginal wall under the urethra. I could not determine that the scar involved the urethral wall. This may have been a clinical stricture due to compression from without. One young woman had severe bladder distress accompanied by bleeding following catheterization while in a hospital convalescing from an appendectomy. Another woman began having symptoms following the passage of a stone. Fulguration of a urethral caruncle was followed by a stricture of the meatus in one case. A young woman who was treated with radium for cervical carcinoma later developed a stricture. Multiple urethral abscesses and a stricture were found in a woman who had been treated for urethral abscesses some years before. A woman said that she had fallen on a chair at five years of age and injured the perineal region and was unable to pass her urine for twenty-four hours. She had had attacks of bladder distress for thirty-five years when I first saw her. A child nine and one-half years old had been a bed wetter all her life. During the day she had had urgency and partial incontinence. Examination showed a congenital stricture of the meatus, residual urine and pyelonephritis but no dilatation of the ureters or kidney pelves. The meatus was dilated, and the kidney pelves and bladder lavaged. The infection improved until there was no pus in the urine although a bacilluria was still present when she stopped treatment. I examined her four years later and found the urine sterile and no residual. At the present if she is awakened once during the night she does not wet her

bed and she has no incontinence during the day. One young woman had a chronic ulcer involving the urethra and part of the vestibule. There was a scar tissue stricture near the sphincter.

The etiology in 16 cases was not determined.

Site.—Twenty-four strictures occurred in the lower third of the urethra; 3 of these were at the meatus and 3 just within the meatus. There were 3 strictures in the middle third. Six strictures were in the upper third and 3 of these involved the sphincter. There was one generalized stricture beginning a few millimeters above the meatus.

There were no multiple strictures in this series.

Urethroscopic Findings.—In only 5 cases was scar tissue visible through the urethroscope. Localized inflammation was present at the site of the stricture in 13 cases. Urethral abscesses were present above a scar tissue stricture in one case. The urethra above the meatus was normal in the child who had a congenital stricture of the meatus. Dilatation of the urethra above the stricture was observed once, but there was no dilatation of the bladder, ureters, or kidney pelves.

A complete examination of the upper urinary tract was made in 8 patients. No abnormalities were found except pyelonephritis (3 cases) and ureter stricture (2 cases). The bladder was normal in the majority although a mild cystitis was found in a few patients.

Size.—

26 F.	25 F.	24 F.	22 F.	21 F.	18 F.	15 F.	12 F.	10 F.
1	1	1	1	12	7	4	6	1

In every case except the 3 strictures of the meatus, the strictured area was from 3 to 18 (F.) sizes smaller than the meatus. There were no symptoms referable to the stricture in 7 cases which measured as follows:

Caliber of meatus	30 F.	29 F.	26 F.	25 F.	25 F.	28 F.	22 F.
Caliber of stricture	26 F.	25 F.	24 F.	21 F.	21 F.	18 F.	18 F.

In all 7 of these cases there was a definite annular obstruction to the passage of a sound that passed through the meatus without difficulty.

Symptoms.—The complaints were numerous and as follows: Burning urination (14), urinary frequency (11), nocturia (5), urgency (4), difficulty passing urine (4), slow voiding (3), dysuria (3), passing blood (3), soreness in the urethra (3), pain in the bladder (3), dull ache and soreness on voiding (2), dribbling irregularly (2), unable to void (2), small stream (1), bearing down (1), dyspareunia (1), bed wetting (1), urinary incontinence (1).

Few of the symptoms were indicative of stricture alone.

Treatment.—Dilatation with Hegar dilators was carried out in each case from 1 to 12 times; the majority of patients had from 4 to 8 dilatations at intervals of from one week to two months. A meatotomy was done once.

Results.—Thirteen women were observed from one to eight years and were completely relieved when last seen. Eight were improved. One was unimproved. Temporary relief was obtained in three cases: one for four months, one for eighteen months and one for one year and later after another course of treatment for two years. I have been unable to follow the others.

SUMMARY

Gonorrheal urethritis was the most common known etiologic factor in my series.

Childbirth caused sufficient injury to the urethra in certain instances for stricture to develop.

The etiology was not determined in nearly half of this series.

Repeated dilatation gave relief in the majority of cases when carried out for a reasonable length of time.

Obstruction to the passage of a sound that will pass the meatus without difficulty may be present without causing symptoms.

We do not know what the pathologic picture is in the majority of our clinical strictures.

It is probable that many of the symptoms complained of are due to the accompanying urethritis rather than to the narrowing of the lumen.

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DISCUSSION

DR. JAMES E. DAVIS, Ann Arbor, Michigan.—I am not persuaded that gonorrheal infections alone are very commonly the cause of stricture. If one follows the effects of gonorrheal infection in tissues where there is an epithelial covering, the epithelium will commonly be denuded but there is very little destruction of the underlying stroma unless there are other than the gonorrheal types of infections present. If there is a staphylococcic infection or a severe streptococcic infection mixed with the gonorrheal infection, then the liability is greater.

DR. WALTER T. DANNREUTHER, NEW YORK CITY.—At the New York Post-Graduate Medical School and Hospital the Department of Gynecology has included a separate cystoscopic clinic for twenty years. Although I have not had an opportunity to review our statistics I feel justified in stating that we have found urethral stricture in the female as a very unusual condition. In general, patients with a small meatal opening or an obstruction somewhere along the urethral lumen may be arbitrarily classified in four groups: first, those that come within the category of developmental defects; second, those that result from birth trauma; and third, those that follow infection or are associated with some complicating disease. Then there is a fourth group, which in my experience has been encountered most often, to which I do not think that Dr. Wynne referred; namely, those that result from the careless or reckless use of the cautery or diathermy current. I have seen several cases in which the destruction of Skene's glands by one of these methods was followed by a pronounced stricture. In the removal of caruncles, treatment of Skene's glands, etc., irrespective of whether the cautery or diathermy is used, it is imperative that the operator restrain his enthusiasm and exercise considerable skill in accomplishing his purpose without damage to the floor of the urethra. And after these procedures have been carried out, sounds should be passed occasionally during the next few months as a precautionary measure against the organization of a stricture. A useful instrument in the treatment of stricture of the urethra in women is the conical dilator. With preliminary local anesthesia and sterile glycerin lubrication, most of these strictures can be dilated, and a meatotomy or urethrotomy avoided.

DR. WYNNE (closing).—I think Dr. Dannreuther misunderstood me regarding the ring type of meatus. I do not consider the ring type of meatus as a stricture. Several observers have reported a large percentage of strictures at or just within the meatus. I believe that most of these are normal ring type meatus. I have had only three strictures of the meatus, one congenital and one due to fulguration of a caruncle. There were none following treatment of Skene's glands.

The Kelly conical dilator, in my experience, is excellent for dilating the meatus. Inasmuch as the meatus is usually smaller than the remainder of the urethra this dilator is very useful. It is not a good dilator to use for strictures occurring in the urethra above the meatus.

A STUDY OF HUMAN UTERINE MOTILITY*

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(From the Department of Obstetrics and Gynecology, The University of Chicago, and The Chicago Lying-in Hospital)

MANY clinical observations have been made of uterine contractions and the effect of various drugs on the pregnant, parturient, and puerperal uterus. Considerable experimental data have been accumulated both from studies of uteri of lower animals and of human uteri, and certain biologic standards of pharmacologic value have been established. There have been relatively few observations of an experimental and scientific character regarding the effect of various drugs upon the human uterine muscle. Such observations are, and further data will be, of immense value in determining accurately the therapeutic action and value of many drugs which are in common use. These observations must be based upon a primary understanding of the physiologic behavior of the uterus itself.

Studies of uterine motility have been made, originally by Schatz and recently by Ruckers, Bourne and Burn, and others. More recently, Ivy, Hartman, Koff and Rudolph have made extensive studies, especially of the uteri of monkeys. One fact seems to stand out clearly, namely, that the uterus does not act synchronously, as a whole, and that there is a marked difference in the contractile behavior of the upper and lower uterine segments.

We felt that it would be possible to make some studies of the action of the human uterus, without added risk and danger to our patients. For some time past it has been our custom to insert a uterine pack following the low cervical cesarean section. This pack is left in situ for from six to twelve hours and then withdrawn through the vagina and cervix. The purposes of this pack are to control bleeding and to provide an adequate canal for subsequent drainage. We decided that a small hydrostatic bag inserted at the time of operation, with its stem carried out through the cervix and vagina, would serve the same purposes and be of no more risk to the patient. This would further give us a means of observing uterine contractions for some hours postpartum.

The details of the method were worked out largely by Dr. M. Edward Davis, and consisted of the following appliances: A Gorrell kymograph, with the necessary drums and pen for making the ink tracings; a mercury manometer attached by a float to the needle and rubber pressure tubing from the bag stem to the manometer. In this circuit a large air-tight bottle partially filled with sterile water was in-

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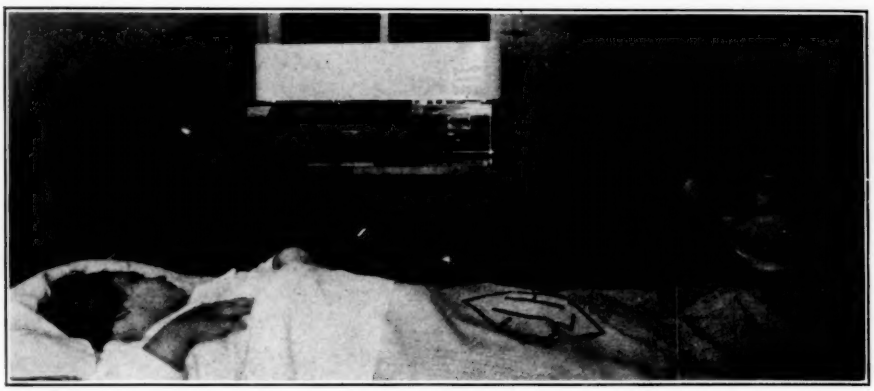
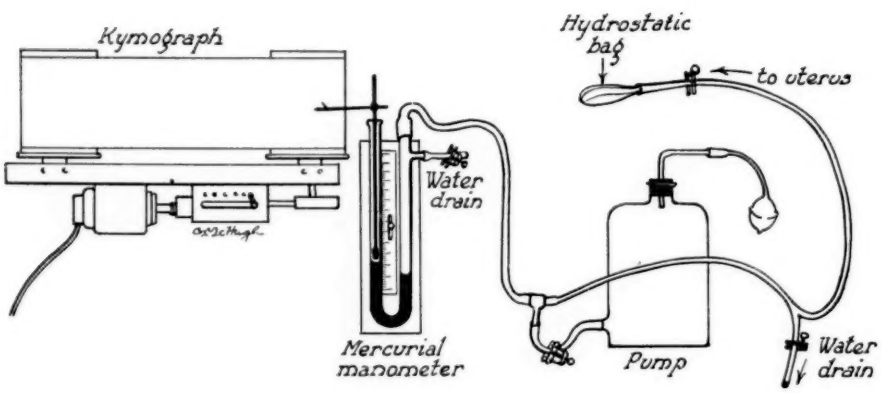
serted. An air pump was connected to the neck of the bottle so that the pressure of the fluid in the bag could be regulated. Three-way connections were placed at the connection with the manometer, the outlet of the large pressure bottle, and near the stem of the bag. In this way air could be removed from the circuit, and the fluid pressure within the bag and water circulation could be regulated (Figs. 1 and 2).

Usually, the bag partially inflated with fluid was easily introduced into the upper segment through the incision in the lower segment immediately after the spontaneous expulsion of the placenta. If the uterus contracted promptly, some



A.



B.

Fig. 1.—*A*. Apparatus assembled and in use. *B*. Diagram of apparatus shown in *A*.

little force was necessary. Once the bag was in the upper segment the uterus contracted about it promptly and held it in place nicely. However, occasionally vigorous uterine contractions would force the bag into the lower segment before the experiment could be well started. It was usually found feasible to pack the lower uterine segment with gauze in order to retain the bag in the upper uterine segment when observations on that portion of the uterus were desired. The stem of the bag was pushed through the cervix into the vagina. After the experiment was completed, the bag was deflated and removed easily through the vagina by a gentle pull on the stem.

It has been shown previously by Ivy, Hartman and Koff, especially in uteri of monkeys, that there are different reactions in the upper and lower segments of this organ, so far as uterine contractions are concerned. Some details of our observations will be given later.

At this point we desire to stress the fact that it is important to know where the bag is located when studying either the physiologic contrac-

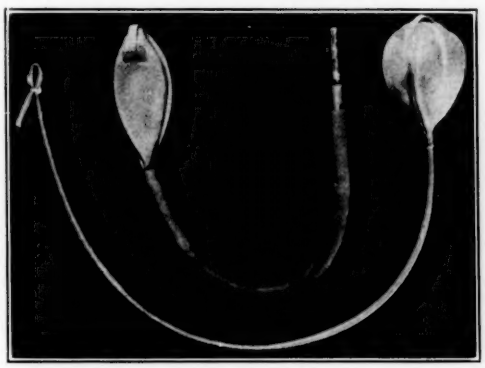


Fig. 2.—Hydrostatic bag used (large Hagner bag—V. Mueller and Co.).

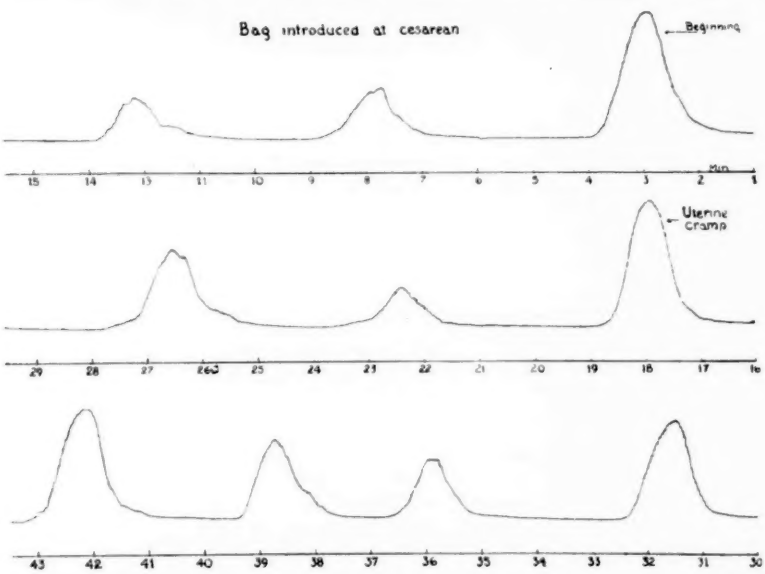


Fig. 3.—Normal uterine contractions in the immediate postpartum period following cesarean section, showing the type of contractions.

tions or those which result from the administration of various pharmacologic preparations. It is not our purpose to discuss in detail the physiology and pharmacology of uterine contractions. The literature has been reviewed and published recently by Blair-Bell, Datnow and Jeffcoate. Our work for this article was done independently and prior to the above publication, so that our observations and conclusions were

in no way influenced by any knowledge of theirs. We do wish to point out some of our observations, relative to normal contractions in the pregnant, parturient, and postpartum uterus, and the effect of some of the oxytocic preparations upon the uterine contractions (Fig. 3).

This presentation practically will be limited to a few observations upon the effect of some pituitary extracts and preparations of ergot, including gynergen and quinine.

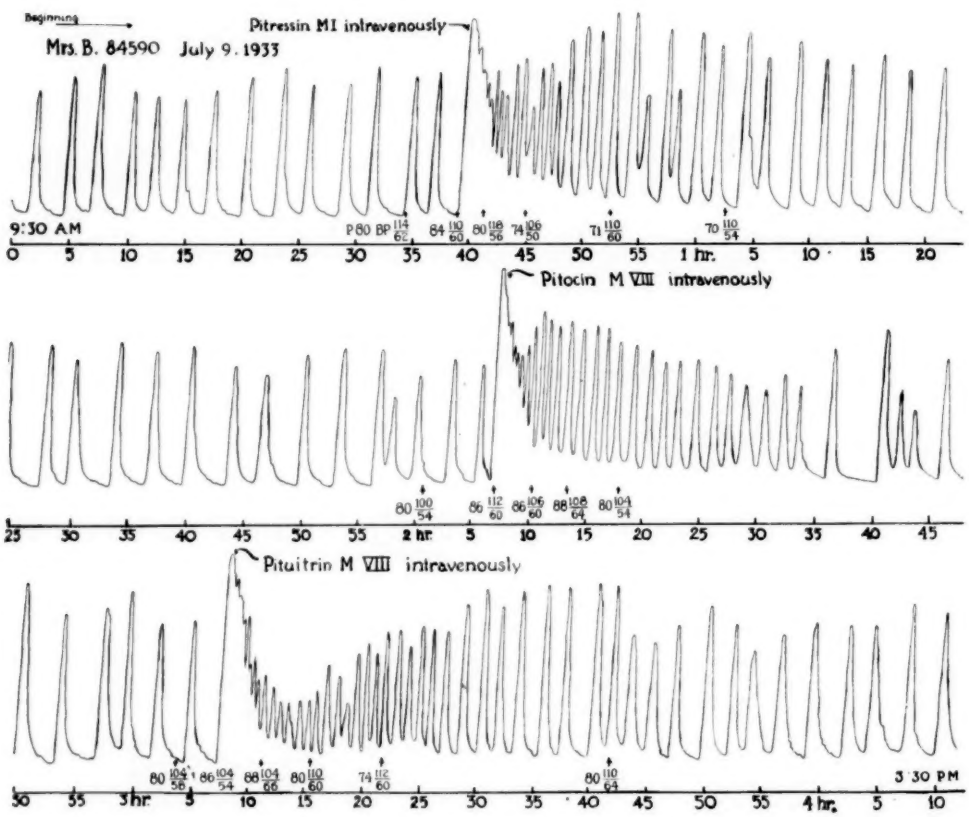


Fig. 4.—Tracings of uterine contractions of Case I, showing the effects of pituitrin, pitocin, and pitressin.

The possibilities of the method which we have employed are manifold, and at this time we are touching only upon one phase of our observations. It is hardly necessary to point out that the checking of the action of various pharmacologic preparations on the human uterus is not only highly important from a scientific point of view, but it is of the utmost value in determining rational drug therapy.

Our material consisted of the following typical cases, illustrating the points that we wish to bring out. Each case report is accompanied by typical portions of the kymographic tracings which, for the most part, are self-explanatory.

GROUP I. PATIENTS IN LABOR

CASE 1.—Previous cardiac decompensation; existing pregnancy of about sixteen weeks with threatened decompensation. Therapeutic abortion was done by rupturing the membranes and inserting the hydrostatic bag, which was connected with the water pressure circuit, manometer and kymograph. Uterine contractions began almost immediately, even before the patient was conscious of pain. The type of the curve was the same, prior and subsequent to the sensation of pain, which began about one hour after the onset of contractions. The difference in the curve was one of increased frequency and greater amplitude. Apparently the pain is a matter of quantitative rather than qualitative change in the character of the contractions. During the process of a previable labor this patient received intravenous injections of pitressin, pitocin, and pituitrin at intervals of about one and one-half hours. The effect of the drug usually disappeared within half an hour and normal contractions continued for about one hour before another preparation was injected (Fig. 4).

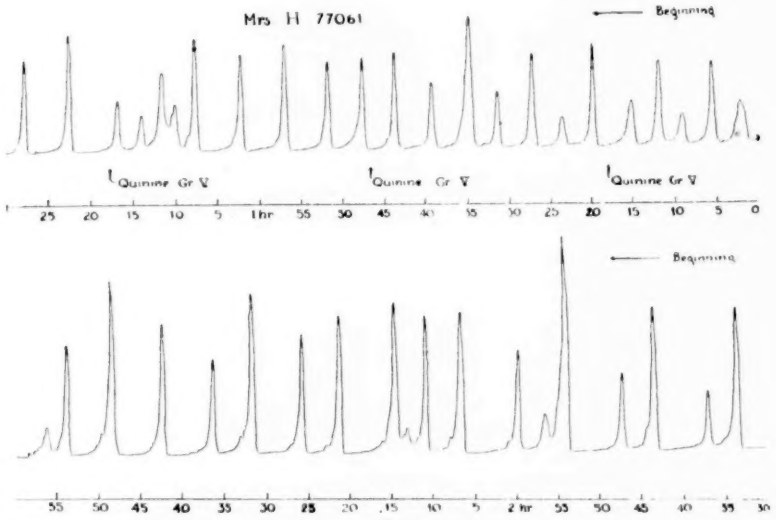


Fig. 5.—Tracings of uterine contractions of Case 2, showing the effect of quinine.

CASE 2.—Mild toxemia, exophthalmic goiter, anencephalic monstrosity, pregnancy of thirty-eight weeks. Premature labor was induced by rupture of the membranes. The bag was inserted high above the presenting part and was left in situ during the process of labor. It was not expelled until the fetus was delivered about sixteen hours after the induction. Contractions began about an hour after the induction, but were not painful for about four hours. The pain was associated with increased frequency and amplitude of the curves. We were apprehensive of the use of pituitary extracts in this case, which was the first one observed near term during the entire process of labor. Doses of quinine sulphate were given in varying amounts and at different time intervals (Fig. 5).

GROUP II. IMMEDIATE POSTPARTUM CASES (APPROXIMATELY 25) IN WHICH LOW CERVICAL CESAREAN SECTIONS WERE DONE

These operations were performed for varied indications. The bag was introduced at the time of operation, as mentioned previously. So far as we know, this is the first time that such observations have been made on uterine contractions in

the immediate postpartum period. We regard these cases as particularly well adapted for such observation, as the upper segment is not traumatized by operative procedure and the bag can be placed accurately in the contracting upper segment which hugs it closely and keeps it out of the tonic lower segment. The action of the upper segment is shown in Figs. 3 to 12 with and without the use of oxytocins.

In several cases we began the experiment by introducing the bag in the upper segment, according to the technic previously described, and after the contractions

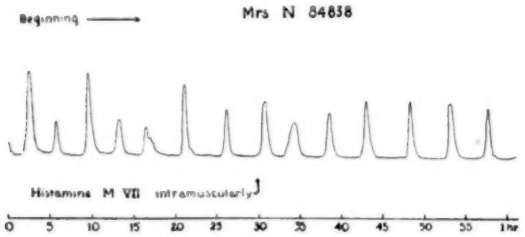


Fig. 6.—Tracings of uterine contractions of a patient in the immediate postpartum period, showing the effect of histamine on the uterine motility.

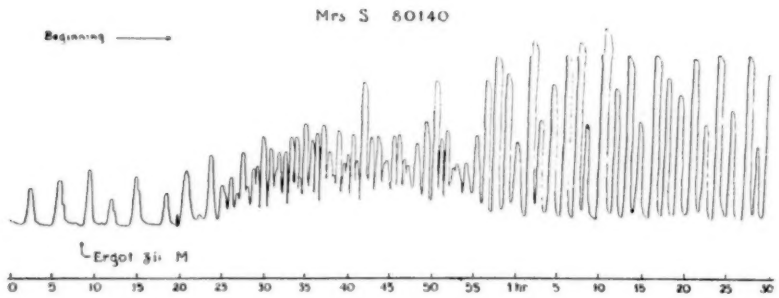


Fig. 7.—Tracings of uterine contractions of a patient in the immediate postpartum period, showing the effect of ergot (typical ergot curve).

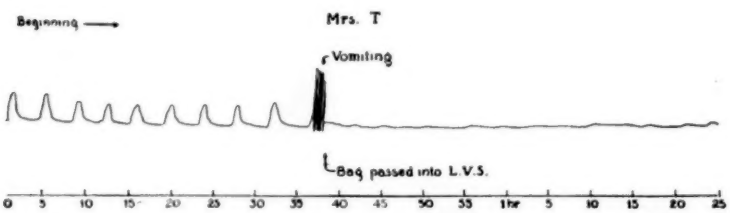


Fig. 8.—Normal uterine contractions of the upper segment, compared with the absence of contractions in the lower segment. It is noted where the bag was pulled from the upper segment into the lower segment.

were recorded for a number of hours the bag was gently pulled into the lower segment, where it remained again for several hours. This was done to study the differences in the two segments of the uterus (Fig. 8).

GROUP III. LATE POSTPARTUM CASES

In these patients the bag was inserted about the eighth day postpartum. The cervical canal at this time easily admits the passage of the balloon. We were very careful to select patients who had an unusually normal labor and convalescence.

The bag remained in situ for from four to six hours. The various drugs were used in order to note any differences that might exist at this stage of the puerperium (Figs. 9, 10, and 11).

Nursing on the eighth day postpartum in the case which we observed seemed to have practically no effect on the uterine contractions, which were obvious at this time (Fig. 11). The administration of ergot by mouth elicited a response with increased frequency of the uterine contractions and tonicity. The action began in ten minutes and continued after reaching the acme in approximately twenty minutes, with diminishing intensity for an hour or more (Fig. 10).

The uterus on the eighth day postpartum is also susceptible to the action of pitressin, pitocin, and pituitrin, as is shown in Fig. 9. The resulting curves are quite similar for these preparations and are unlike the curve produced by ergot.

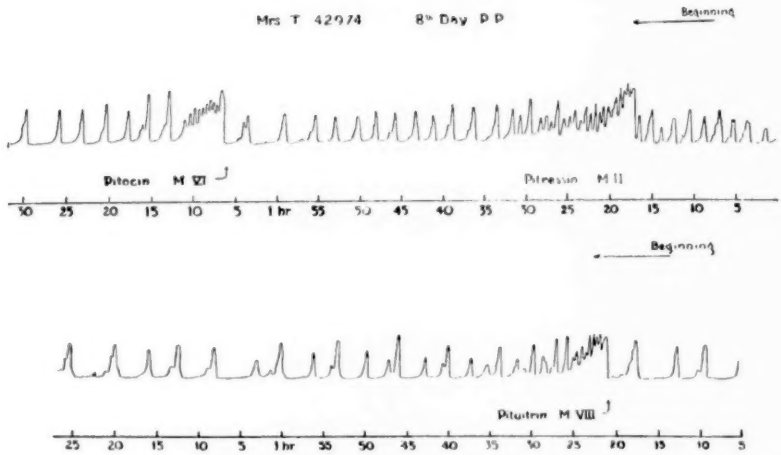


Fig. 9.—Tracings of uterine contractions of a patient on the eighth day postpartum, showing the effects of pitocin, pitressin and pituitrin.

One may conclude that the uterus is actively contracting on the eighth day postpartum when a bag is inserted. It is also responsive to the administration of oxytocic agents at this period of the puerperium.

We believe that a more accurate picture of the difference in the action of the upper and lower segments is shown by the graphs made from the use of the bag in the immediate postpartum period. The following kymographic curve shows comparative graphs for the upper and lower uterine segments in the same case (Fig. 8). They show also the effect of various oxytocic agents upon the upper and lower segments. The upper segment contracts actively and intermittently, but not absolutely rhythmically. It has an underlying tonicity and the contractions can be influenced by the administration of various oxytocic agents. The lower segment has a lesser degree of tonicity, it does not show any active contractions and, so far as we have observed, the tonicity is not altered and the contractions are not stimulated by the various oxytocic preparations which we have used. The location of the bag in the lower segment was controlled by digital examination at the time of its removal.

GENERAL CONSIDERATION AND CONCLUSIONS

All of our observations have extended over a period of time in excess of six hours. The kymograph is geared and has a synchronous motor so that time relationships can be determined accurately.

The cases presented are illustrative and do not represent our entire series. The graphs, while available in their entirety, are not presented here with completeness, but only to show the crucial changes.

The physiologic status, tone, and contractions of the uterus are shown in our curves. Both segments have tone, but that of the lower segment is definitely less than that of the upper segment. This seems to be

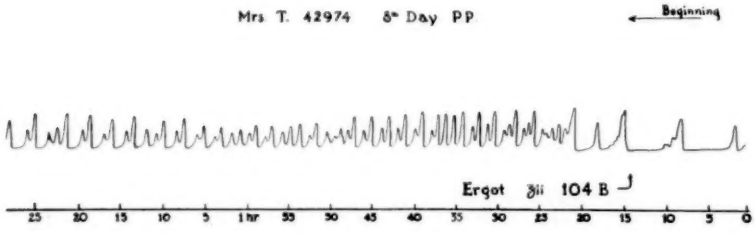


Fig. 10.—Tracings of uterine contractions of a patient on the eighth day postpartum, showing the effect of ergot.

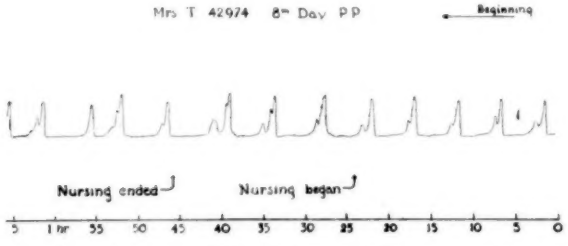


Fig. 11.—Tracings of uterine contractions of a patient on the eighth day postpartum, showing the effect of nursing.

true in both the parturient and postpartum uterus. The tone of the upper segment can be influenced by certain preparations which we have used, viz., pitressin, pitocin, and various pituitary extracts. The action of ergot preparations is uncertain, but when present the tone is increased. Quinine apparently does not increase the tone of the upper segment. None of the preparations we have used seemed to influence the tone of the lower uterine segment.

The contractions of the upper segment are not always associated with pain. Their amplitude is not uniform, nor is their frequency. They are not absolutely rhythmic, either in degree or in time. Using painful uterine contractions as the criterion for the onset of labor, it could be stated that the uterine contractions prior to the onset of labor do not vary greatly in frequency or in amplitude. After painful contractions

commence, the first change noted is in the amplitude; this is followed by increased frequency and greater excursions in the amplitude. However, variable amplitudes and time intervals persist.

The type of curve seems to be the same prior to the onset of painful contractions, during labor, and in the postpartum period. In analyzing the individual contractions it is observed that pain does not occur until the contraction is well advanced. The pain begins about the upper third of the "up" curve, continuing during the acme, and about the upper two-thirds of the "down" curve. This coincides with clinical observations of uterine contractions during labor (Fig. 3).

Our observations corroborate those of other investigators that there are no physiologic contractions of the lower uterine segment. We were unable to excite any such contractions by means of any of the oxytocic agents which we employed.

Quinine sulphate, when used during labor in the physiologic doses (up to 20 grains within an hour), may produce an increase of amplitude, but there appears to be no increased frequency of the contractions and no increase of muscle tone. The action does not seem to be either constant or striking (Fig. 5).

Ergot and Ergot Preparations.—Alcoholic and watery preparations of ergot were used. The United States and British Pharmacopoeial preparations, in addition to specially prepared extracts, were employed. We are making a more detailed study of ergot and its action, but thus far our observations point to the conclusion that both the preparations and the reactions are very inconstant. Even though the positive results of the administration of ergot by mouth were infrequent (about one in three cases), nevertheless, when a reaction was obtained the curve was quite typical and of a constant character (Fig. 7). The effect was apparent in from about twenty to thirty minutes and appeared first as an increased tonicity, followed by a gradually increasing frequency and amplitude. The maximum reaction was present in from fifty to sixty minutes, after which the frequency, amplitude, and tone gradually receded to the previous level after about two hours. The action of ergot, then, can be said to last for at least two or three hours. Many factors must influence the activity of ergot on the human uterus. The discussion of these various factors will be made the subject of a future communication. No ergot was administered to patients in labor, so our observations and conclusions are limited to its action upon the postpartum uterus.

Ergotamine tartrate was tried in several cases during labor and in the postpartum period. The dose was 1 c.c. administered intramuscularly. So far as we could determine there was no effect upon the contractions or muscle tone in any of our cases (Fig. 12). Subsequently some effect was demonstrated following oral administration.

Moir and Dale, in their observations of the action of ergot upon the uterus from the sixth to the eighth day postpartum, using the method of Bourne and Burn, found that aqueous preparations made according to British standards were effective, whereas the alcoholic extracts were more or less inert. There is, evidently, great variability in the potency of different preparations of ergot, and many factors as yet not fully determined influence the reactions upon individual patients. Some have assumed that the action of ergot is due to histamine and histamine-like substances. In order to test this substance, up to 0.001 gm. was given hypodermically, with no apparent effect on the uterine tone or contractions, though the usual histamine response was obtained. It was

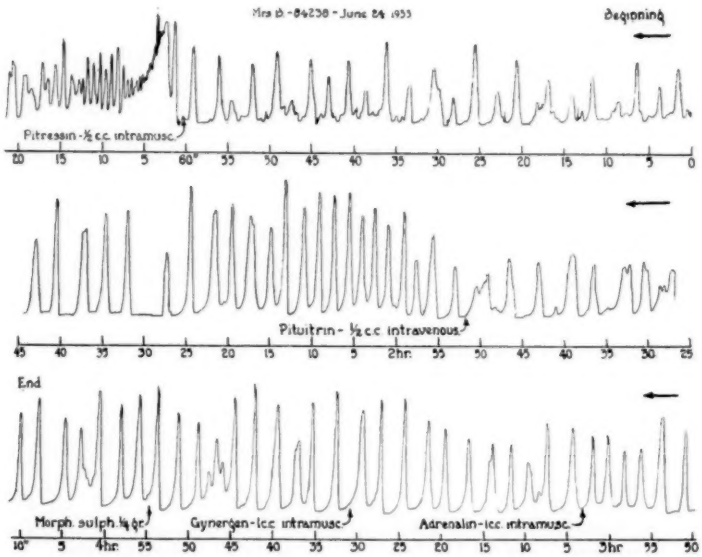


Fig. 12.—Tracings of uterine contractions in the immediate postpartum period, showing the effect of the various drugs listed on the graph.

not deemed safe to give a larger dose. Even the 0.001 gm. dose which we employed is regarded as a rather large one, and we did not deem it safe to give a larger amount. In any case, the quantity of histamine possibly present in the dose of ergot used would be very minute (Fig. 6).

Pituitary Extract and Its Fractions.—The observations which we have made upon pituitary preparations and fractions are probably the most significant and disconcerting of any which we have thus far made.

Kamm and his coworkers have separated fractions of posterior pituitary substance which they have designated by the names "pitressin" and "pitocin." The former is supposed to contain the diuretic and pressor principles, and in its pure state to contain none or less than 0.5 per cent of the oxytocic principle. The latter contains, predominantly, over 99 per cent of the oxytocic principle.

Bourne and Burn seem to be the only investigators who have noted, experimentally, the action of pitressin upon human parturient uteri. They found no response. Other investigators (Reynolds and Friedman) have used experimental animals, chiefly the rabbit. Their conclusions have been quite uniform and show that in the rabbit pitressin causes an immediate cessation of uterine contractions, with a diminution of the tonicity. This persists for some time and then the normal curve returns.

Pitocin causes almost a tetany of the rabbit's uterine muscle, followed by increased contractions and tone. The reaction is similar to but less intense than that resulting from the use of pituitrin.

Robson found that all of these preparations would cause uterine contractions in the uterus of the virgin rabbit, but that pitressin was inactive upon the uterus of the guinea pig.

Blair-Bell and his coworkers found that the uterine muscle of the guinea pig responded to all of these substances, but that pituitrin had the most pronounced action.

Most of our studies with posterior pituitary extract and its fractions have been made on the uterus immediately postpartum and continued for six or more hours. We have some observations which we have made upon pregnant uteri which will be given in their appropriate places. All of these preparations were given intravenously for the purpose of exactitude. The order of administration in individual cases varied so that the possible effect of one preparation upon another could be determined or eliminated. Also, a sufficient lapse of time was allowed between their administration to permit the uterus to resume its normal activity for an hour or more.

The dosage varied with the different preparations. Pitressin was given in doses of from one to three minims because of the rather severe reactions which the patients experienced. The reaction came on almost instantaneously and was ushered in by pallor of the mucous membranes and the skin, nausea and usually vomiting, feeling of oppression and difficulty in breathing. Respiratory and pulse rates were not particularly altered. In a few toxemic cases the blood pressure was elevated. The reaction passed off in a few moments, with no untoward results in any case. In some cases there was a feeling of urgency to urinate and in some a desire to defecate.

Pitocin was given in doses of from three to eight minims. There were no unpleasant reactions from this preparation. The varied amounts given did not seem to diminish or intensify the uterine reaction.

Pituitrin was administered in doses of from five to eight minims. There was no unpleasant reaction from this substance, though in one case there was marked acceleration of the pulse rate. The size of the dose within the above limits did not seem to effect the intensity of the

uterine response. Infundibulin was tried also in corresponding dosage, with identical results. The reactions of these various substances are shown in the following kymographic tracings (Fig. 4, during labor; Fig. 12, immediate postpartum period; Fig. 9, late postpartum period).

All of these preparations showed an almost immediate response in altered uterine contractions. The curves on the tracings are almost identical in type. Pitressin, although given in a considerably smaller dose, elicited practically the same uterine response. There is an abrupt increase in uterine tone and increased amplitude of the uterine contractions. This is followed by tetany, which is replaced by uterine contractions of lower amplitude but of increased frequency.

The uterus relaxes gradually and within from thirty to fifty minutes it has returned to normal tone and contractility. In three cases in which hysterotomy (2) and cesarean section (1) were being done, pitressin was given while the uterus was exposed through an abdominal incision. Almost immediately the uterus became firmly contracted, with constriction of the vessels and a blanched appearance of the surface. It remained in this state for several minutes; as the tetany subsided some contractions continued intermittently and the color returned to normal.

We conclude that so far as the human uterus is concerned, we cannot distinguish between the action induced by pitressin, pitocin, pituitrin, and infundibulin by our tracings of uterine tone and contractions.

We have done no work with these substances upon experimental animals, but feel that the work which has been done by others indicates that not all species of animals react the same to these different preparations. We believe also that the fact that certain reactions are produced in laboratory animals is no justification for establishing them in our practice with human beings.

Lastly, it is very difficult to evaluate the oxytocins from clinical observations. There have been great divergencies of opinion regarding the action of quinine, ergot preparations, and pituitary fractions and substances upon the uterus. Our observations indicate that differences of opinion have been justified by varying clinical experiences, and we believe that much more work is necessary before their value in human therapeutics can be finally established.

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STARVATION HYPOGLYCEMIA IN LATE PREGNANCY*

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DISTURBANCES of carbohydrate metabolism have interested obstetricians since Duncan and Harding[1] and Titus, Hoffman, and Givens[2] claimed that carbohydrate deficiency (hypoglycemia) may have an etiologic significance in the various toxemias of pregnancy. Titus, Dodds, and Willetts[3] finally enunciated the theory "that eclamptic convulsions are directly related to and probably the result of hypoglycemic levels during the course of the disease."

This study concerns the induction of artificial hypoglycemia through starvation in 53 normal women in the last two months of gestation. After admission to the clinic as waiting patients, one or two preliminary twelve-hour-fasting determinations were made on each individual to establish the normal blood sugar level. In only 5 instances (Cases No. 3, 26, 30, 34, and 46) was the normal value higher than 100 mg. per cent. Sometime later, each patient was fasted for fifty hours and blood specimens were obtained for analysis at twelve-hour intervals. During the starvation period, water was permitted as desired, but no food was ingested. All determinations were made by the Gibson (Folin-Wu) method[4] and were completed promptly after the blood was drawn. Sufficient specimens were also analysed by the Somogyi (Shaffer-Hartmann) method[5] to check the accuracy of the Gibson technic. Qualitative tests for acetone bodies were made by the Legal method.

In a preliminary study, the Gibson method for blood sugar was compared with the Somogyi procedure on 77 specimens obtained from pregnant women near term after twelve hours' fasting.

The two methods gave average values of 66.8 mg. per cent (Gibson) and 66.6 mg. per cent (Somogyi), and in general there was close agreement between individual samples. Since both methods presumably eliminate the nonsugar reducing substances which tend to complicate blood sugar determinations, the results may probably be taken as indicating the true sugar content of the blood. In the lower concentrations, the Somogyi method tends to give higher, and in the medium ranges lower, values than the Gibson technic.

In a further attempt to evaluate the accuracy of the two methods, glucose was added to glycolysed blood (by addition to the precipitating fluid) to place the sugar content at known and predetermined levels.

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TABLE I

COMPARISON OF THE GIBSON AND THE SOMOGYI (SHAFFER-HARTMANN) METHODS ON THE BLOOD OF NORMAL PREGNANT WOMEN NEAR TERM AFTER TWELVE HOURS' FASTING

SPECIMEN	METHOD		SPECIMEN	METHOD	
	GIBSON	SOMOGYI		GIBSON	SOMOGYI
1	78	77	41	39	50
2	75	76	42	34	39
3	74	78	43	42	52
4	66	71	44	54	53
5	79	77	45	77	70
6	67	65	46	77	72
7	45	58	47	75	70
8	41	45	48	89	78
9	38	53	49	86	78
10	78	76	50	70	68
11	74	77	51	80	72
12	92	89	52	93	87
13	77	78	53	80	70
14	75	78	54	84	76
15	79	77	55	86	85
16	63	74	56	42	44
17	44	54	57	46	47
18	47	58	58	50	58
19	48	55	59	75	71
20	40	49	60	83	69
21	40	51	61	83	69
22	77	72	62	70	69
23	80	80	63	80	75
24	79	72	64	68	69
25	72	67	65	71	75
26	64	74	66	79	70
27	74	75	67	79	70
28	38	46	68	80	72
29	33	34	69	86	79
30	36	44	70	92	76
31	30	34	71	78	72
32	47	52	72	80	75
33	45	47	73	82	72
34	44	55	74	87	73
35	69	70	75	77	73
36	67	65	76	80	76
37	74	75	77	94	91
38	72	78		—	—
39	58	58	Average	66.8%	66.6%
40	36	48			

Such analyses (Table II) indicate that the nonsugar reducing substances present in the blood do not appreciably affect the results by either method. There is, at all ranges, close agreement between the theoretical and the determined sugar content.

Results after starvation. For purposes of comparison, the 53 patients subjected to fifty-hour starvation were grouped according to parity, as follows:

Group I, primigravidas
Group II, 1 to 4 previous pregnancies
Group III, more than 4 previous pregnancies

TABLE II

COMPARISON OF THE RESULTS OBTAINED WITH THE SOMOGYI (SHAFFER-HARTMANN) AND THE GIBSON (FOLIN-WU) METHODS ON GLYCOLYSED BLOOD TO WHICH KNOWN AMOUNTS OF GLUCOSE HAVE BEEN ADDED.
(RESULTS IN MILLIGRAMS PER CENT)

MATERIAL ANALYSED	METHOD			
	GIBSON		SOMOGYI	
	FIRST RUN*	SECOND RUN	FIRST RUN	SECOND RUN
Glycolysed blood	23	23	15	15
Glycolysed blood + 40†	65 (42)‡	64 (41)	57 (42)	56 (41)
Glycolysed blood + 60	81 (58)	86 (63)	76 (61)	82 (67)
Glycolysed blood + 80	102 (79)	104 (81)	104 (89)	102 (87)
Glycolysed blood +120	145 (122)	142 (119)	138 (123)	137 (122)
Glycolysed blood +140	159 (136)	162 (139)	157 (142)	155 (140)
Glycolysed blood +160	182 (159)	186 (163)	185 (170)	186 (171)

*Each run represents three readings.

†The glucose was added directly to the diluting fluid to increase the content by the indicated number of mg. per 100 c.c.

‡The values in parentheses (__) represent the determined content minus the value obtained for the glycolysed blood alone. The difference should theoretically be the same as the added glucose (†).

Table III gives the individual results, while in Table IV average values for the three groups are presented.

Considering Table IV, it is evident that, as the number of previous children increases, the normal twelve-hour fasting blood sugar tends to rise slightly, although individuals in any group may not conform to the average; and that the effect of longer fasting is less marked in parous women, especially in those who have been pregnant more than four times previously.

At the end of the various twelve-hour fast periods (Table III) the blood sugar values arrange themselves as shown in Table V.

Sixteen of the 53 patients (30 per cent) started in labor before the end of the fast (two before the completion of the thirty-six-hour period and six between thirty-six and forty-eight hours), or within twenty-four hours after its cessation (8 cases). In the two instances where parturition was in progress when the thirty-six-hour sample was taken, the blood sugar was lower than it had been at twenty-four hours; but higher (58 mg. per cent) than the average thirty-six-hour value for Group II (46 mg. per cent). When labor supervened after the thirty-six-hour sample but before the forty-eight-hour specimen, the latter was always considerably higher (average 63 mg. per cent) than the former (average 50 mg. per cent). When labor began only after the fast had been broken, the forty-eight-hour specimen showed no significant increase over the thirty-six-hour figure. Apparently, the rise in blood sugar during labor is a direct result of the expenditure of muscular energy (liberation of glycogen), since we were unable to detect any preparturitional in-

TABLE III

BLOOD SUGAR DETERMINATIONS

			12 HR. NORMALS				48 HOUR FAST					
				12 HR.		DATE	12 HR.	24 HR.	36 HR.		48 HR.	DATE
	GR.	AGE	G*	G*	S*	OF TEST	G*	G*	G*	S*	G*	DELIV.
1	1	17	84	99		12/18/31	87	71	47		38	2/ 3
2	1	17	87	84		12/18/31	87	59	42		32	12/20‡
3	1	20	104	90		12/18/31	95	68	46		44	2/ 3
4	1	19	80	75		1/13/32	74	43	40		42	1/31
5	1	20	76	87		1/13/32	80	55	47		50	1/26
6	1	18	78	72		1/13/32	71	49	42		46	1/15‡
7	1	17	87	81		3/20/32	100	59	50		62†	3/23‡
8	1	19	68	79		3/20/32	70	67	63		46	4/15
9	1	17	85	80		3/20/32	87	73	52		63†	3/24‡
10	1	19		84		4/ 6/32	98	59	49		47	4/23
11	1	19		90		4/12/32	73	62	68		61	5/ 8
12	1	19		93		4/12/32	87	68	66		72	4/25
13	1	32		80	76	7/21/32	74	70	67	65	73†	7/23‡
14	1	19		77	73	7/21/32	70	45	45	46	47	8/ 1
15	1	27	77	78	77	7/28/32	78	74	45	59	43	9/22
16	1	16	74	71	77	8/ 1/32	78	67	44	54	38	8/13
17	1	19	79	80	77	8/ 1/32	83	77	40	41	38	8/29
18	1	21		80		8/ 1/32	80	74	57		47	8/12
19	1	16	66	77	72	8/ 3/32	74	86	38	47	33	8/16
20	1	15	78	80	80	8/ 3/32	78	100	33	34	33	8/18
21	1	26	70	64	75	8/ 3/32	88	84	47	53	43	8/12
22	1	20	84	67	65	8/ 5/32	77	66	44	39	35	8/27
23	1	20		85		8/ 5/32	81	53	54	53	56	8/18
24	2	30		82		3/10/32	66	50	47		49	3/13‡
25	4	33		91		3/10/32	78	66	58†			3/12‡
26	2	22		107		3/10/32	80	50	42		47	3/25
27	2	24		75		3/10/32	87	64	47		76†	3/12‡
28	2	19		85		3/10/32	87	73	53		51	3/22
29	2	19	72	66		3/20/32	67	57	51		54	4/ 1
30	4	30	96	104		3/20/32	86	91	86		64	4/10
31	2	22	81	78		3/20/32	85	77	62		53	4/13
32	2	28		98		4/ 6/32	96	78	41		65	5/15‡
33	3	43		91		4/12/32	86	67	60		68	5/22
34	3	24		104	111	7/21/32	87	71	47	46	54	8/10
35	2	22	88	81	76	7/28/32	86	44	31	45	32	8/11
36	3	26	80	73	77	7/28/32	72	80	58			8/11
37	2	32	92	90	89	8/ 1/32	87	78	47	58	46	8/ 3‡
38	2	25	73	73	78	8/ 1/32	72	78	48	55	42	8/ 4‡
39	2	19	75	77	78	8/ 1/32	77	73	40	49	38	9/10
40	5	21	70	79	72	8/ 3/32	89	94	36	44	30	8/15
41	2	20	64	72	67	8/ 3/32	90	90	30	34	33	8/12
42	4	22		74	75	8/ 3/32	73	92	45	47	49	8/ 5‡
43	2	24		80		8/ 3/32	74	66	44	55	58†	8/ 6‡
44	3	28	75	69	70	8/ 5/32	78	38	36	38	42	Not Del. Here.
45	3	22	78	72	75	8/ 5/32	79	67	39	40	71†	8/ 7‡
46	6	39		118		4/ 6/32	95	73	72		75	4/28
47	8	36		96		4/12/32	83	74	75		73	4/15‡
48	7	31		90		4/12/32	88	66	55		68	4/22
49	7	38	71	66	71	7/28/32	74	48	39	54		8/17
50	10	44	74	78	76	8/ 1/32	76	77	63	64		8/ 2‡
51	8	34	100	74	75	8/ 5/32	82	73	58	58	58	8/ 9
52	8	37		73		8/ 5/32	75	68	42	42	79†	8/ 8‡
53	7	39	100	96		1/13/32	95	82	78		76	1/23

*Refers to the method used for blood sugar determination. G = Gibson [Folin-Wu.] S = Somogyi [Shaffer-Hartmann].

†Patient in labor at the time the blood sugar determination was made.

‡Patient went into labor within seventy-two hours following the onset of the fast.

crease. Rakestraw[6] has pointed out that short strenuous exercise invariably raises the blood sugar level, while longer periods of activity lower it.

Average values for blood sugar (Table IV) diminish rapidly during the first thirty-six hours of the fast, but tend to remain constant for the next twelve hours, so that the values for the thirty-six-hour and the forty-eight-hour specimens show insignificant differences. In a few instances, continuation of the fast for an additional twelve hours usually showed values at sixty hours slightly higher than at forty-eight hours. It may be significant that in women having had more than four previous pregnancies (Group III) the forty-eight-hour value was higher than that at thirty-six hours.

TABLE IV. AVERAGE VALUES COMPUTED FROM TABLE III

(BLOOD SUGAR, MILLIGRAMS PER CENT)

PARITY OF PATIENT	12-HOUR FAST		24-HOUR FAST		36-HOUR FAST		48-HOUR FAST		PERCENTAGE REDUCTION*
	HIGHEST / LOWEST	AVER.	HIGHEST / LOWEST	AVER.	HIGHEST / LOWEST	AVER.	HIGHEST / LOWEST	AVER.	
Primigravida (23 cases)	104 / 64	81	100 / 43	67	67 / 33	49	72 / 32	45	47
1 to 4 previous children (22 cases)	107 / 64	82	94 / 38	70	53 / 31	46	68 / 30	46	45
More than 4 previous children (8 cases)	118 / 66	87	82 / 48	70	78 / 39	60	76 / 68	70	30
Average for all groups (53 cases)		82		69		50		49	41

*$\frac{\text{Maximum average minus minimum average}}{\text{Maximum average}}$ = Percentage reduction.

It is generally accepted that the glucose content of the blood cannot be reduced appreciably without the appearance of serious clinical manifestations. Macleod[7] says: "In complete starvation the blood sugar does not fall very much below the normal level, and indeed it is known that if it does so, as after insulin or experimental removal of the liver, highly characteristic symptoms supervene which are fatal."

In normal nonpregnant individuals, fasting lowers the blood sugar but apparently never to the levels which we have so frequently noted. Weeks, et al.[8] (1923) studied the plasma sugar in 49 fasting epileptics, using the Folin-Wu method. At the beginning of the fast the average blood sugar value was 87 mg. per cent, but at the end of the second week it had risen slightly to 90 mg. per cent, the lowest value being

59 mg. per cent. Shope,[9] employing the Somogyi technic, obtained a plasma sugar value of 37 mg. per cent after five days' fast with the patient feeling quite well, but at the end of the second day (forty-eight hours) the concentration had fallen only to 67 mg. per cent. Lennox, et al.[10] using the Folin-Wu method, studied seven adults during periods of starvation and found that the blood or plasma sugar diminished during the first week but later rose, approaching the prefasting level in the majority of cases. In three instances, it fell below 60 mg. per cent, with the lowest value 49 mg. per cent, but in none did the blood sugar after forty-eight-hours' fast go below 68 mg. per cent. Shope[11] and Rakestraw[6] found the sugar content of the plasma slightly lower than that of whole blood.

Even after allowing for the known variations in blood sugar content depending upon the analytical methods employed, it is apparent that normal women in the last two months of pregnancy show considerably

TABLE V. DISTRIBUTION OF BLOOD SUGAR VALUES ACCORDING TO DURATION OF STARVATION. (GIBSON METHOD)

AT END OF STARVATION FOR	TOTAL NO.	MILLIGRAMS PER CENT							
		30-39	40-49	50-59	60-69	70-79	80-89	90-99	OVER 100
12 hours	53	0	0	0	2	*22*	*22*	6	1
24 hours	53	1	5	8	13	*17*	4	4	1
36 hours	53	8	*24*	10 (2)*	7	3	1	0	0
48 hours	49	11	*15*	8 (1)	7 (2)	8 (3)	0	0	0

*Figures in parentheses (---) represent the number of patients definitely in labor at the time specified.

lower values than have been reported for nonpregnant individuals. This finding suggests that the developing fetus and the actively growing maternal structures increase the demand upon the glycogen reserves and make the organism less resistant to starvation.

We obtained blood sugar values under 40 mg. per cent in 14 pregnant women (lowest value 30 mg. per cent in Case 4) without the appearance of any toxic symptoms other than occasional slight headaches. Edema, if present, did not increase; the systolic blood pressure fell 10 to 15 mm. within the first twenty-four hours and remained at the new level until the end of the fast; while the urine remained normal except for the presence of acetone bodies. The fall in blood sugar was not so rapid as Titus describes preceding eclamptic convulsions, but the average reduction within forty-eight hours was from 47 per cent to 30 per cent in the various groups. In one instance (Case 40) the fall amounted to 66 per cent (from 89 to 30 mg. per cent), while in two others it was 63 per cent (Case 2, 87 to 32 mg. per cent, and Case 35, 86 to 31 mg. per cent). The absence of any suggestion of the appearance of the toxemia of late pregnancy even in the presence of such markedly reduced blood sugar

values argues against hypoglycemia in itself being responsible for the clinical signs and symptoms of eclampsia and preeclampsia. Moreover, the occasional failure of repeated intravenous injections of glucose solutions to protect the mild preeclamptic patient from the development of convulsions also argues against the hypothesis.

On the other hand, it cannot be disputed that hypertonic solutions of glucose given intravenously have a valuable place in the treatment of the toxemias of late pregnancy, but we are inclined to agree with Schwarz and Dieckmann[12] that the effect is largely physical and is concerned with the replacement of electrolytes, which favors diuresis by increasing the volume of circulating blood.

The onset of labor in patients who are given nothing but water by mouth suggests that resulting changes in the acid-base balance may be responsible, but we have no data to support the idea. Some years since we began treating certain patients with toxemias of late pregnancy by withholding all food and giving only limited amounts (1,500 to 2,000 c.c.) of water per day, in the hope of promoting diuresis and reducing the water held in the tissues, which we believe, with Zangemeister, to be etiologically significant. Parturition started within two to four days in so many of this series that we have been forced to discontinue the treatment, except when the fetus is evidently viable and delivery is considered advisable.

SUMMARY

The Gibson (Folin-Wu) method for blood sugar gives results comparable to those obtained with the Somogyi (Shaffer-Hartmann) technic. Both methods evidently exclude the determination of nonsugar reducing substances, and therefore apparently give true sugar values.

In pregnant women near term starvation for twelve hours leads to blood sugar reductions similar to those observed in nonpregnant individuals, but fasting for fifty hours reduces the blood sugar to levels considerably below those recorded for the nonpregnant. In 14 among 53 such patients the blood sugar fell to less than 40 mg. per cent, and in one case to 30 mg. per cent.

Development of a marked starvation hypoglycemia with acetonuria produces no signs or symptoms of toxemia of late pregnancy, except that mild transient headaches are occasionally noted.

Starvation for fifty hours in the last month of pregnancy is frequently (30 per cent) followed by the (otherwise spontaneous) onset of labor.

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DISCUSSION

DR. HERMON VAN WYCK, TORONTO, ONT.—This paper is confirmatory of views that we have held for sometime, that the occurrence of the later toxemias of pregnancy has no relation to the dietetic factors. Views to the contrary have arisen in a variety of ways, from the traditional methods still in vogue of attempting the prophylaxis or treatment of the toxemia by withdrawal of proteins. There is some basis for the belief in the value of dietetic regimens in the great value that there undoubtedly is in the glucose therapy, but Dr. Plass' paper gives evidence, added to other that we have, that there is no specific relation between the toxemias and a disturbance of carbohydrate metabolism. Carbohydrates do undoubtedly fortify the patient against liver degeneration and against a diminution of the alkali reserve, dangers that are not alone seen in the toxemias of pregnancy. While this paper is confirmatory of the independence of carbohydrate disturbance in the etiology of eclampsia, it must not be interpreted as minimizing the value of glucose therapy. A patient with her liver well stored with glycogen will survive the crisis of the acute condition much better than where these glycogen stores are depleted, and although, with Dr. Plass, one may feel that the hypoglycemia Dr. Titus has reported as preceding the crisis has no etiologic significance, nevertheless one may still agree with the advice that we get from Dr. Titus to use hypertonic glucose in the interval preceding convulsions. In other words, there is no specific relation etiologically between carbohydrate metabolism and the toxic condition.

In such a paper as we have here, the conclusions and findings would remain unchanged perhaps if one were to substitute for the words "the toxemias of late pregnancy" many other toxic and infective conditions. To generalize still further it appears as we hear these papers that the enigma of eclampsia is probably not to be solved by biochemical studies. Perhaps it lies in other fields, in serologic studies, for example. However, it is a valuable contribution to our knowledge of the relation between the progress of the toxemias and carbohydrate metabolism. It is in harmony also with certain studies that were published some years ago from Dr. Hendry's clinic. In these the carbohydrate and fat and protein were compared in their effects on patients in whom the toxic condition was well established. We found that no variation in diet seemed to have any deleterious effect whatsoever on the progress of the eclamptic state with the undoubted exception of common salt.

DR. PAUL TITUS, PITTSBURGH, PA.—To my mind, this paper emphasizes only the view that starvation is merely an incidental thing and will not initiate a toxemia of pregnancy. I do believe, however, that a decrease in carbohydrate intake lowers resistance against toxemia and that an increase will act as a protective measure. As evidence for this we have the classical experiment that a smaller dose of poison is required to kill a starved dog than a well-fed one. Thus glycogen storage in the liver is certainly a protective mechanism.

In connection with Dr. Plass' findings of fairly normal blood sugar levels after starvation may I recall that sometime ago we found in our eclamptic cases that the plasma blood sugar level did not have much bearing on the occurrence of the convulsion, because the convulsion did not occur in our fluctuating waves until the

corpuscular sugar was depleted. Moreover in starvation the whole sugar level in the blood stream is probably the last thing to be affected, falling only after a thorough exhaustion of glycogen stores in the tissues.

If I may define again the term which we once coined, namely "relative hypoglycemia," it might relieve the misinterpretation of my belief as to any relation between slow starvation and the occurrence of toxemias. My colleagues and I do not believe any more than Dr. Plass believes that starvation has a definite initiating rôle in toxemia. It could have a contributing rôle as has been explained. Slow depletion of the blood stream of its sugar can go on to surprisingly low levels without causing symptoms if done slowly enough. A disturbance in carbohydrate metabolism sufficient to cause sudden drops in blood sugar can cause hypoglycemic reactions even at high levels. Our "relative hypoglycemia" is one at which the actual level of the blood sugar does not count nearly so much as the rapidity with which that level has been attained from a higher level, as MacLeod has also pointed out. John of Cleveland has reported a number of patients with hypoglycemic symptoms from insulin but whose blood sugar was over 200 mg. per hundred c.c. of blood. That level of approximately 200 mg. had been suddenly attained from a still higher level at which a large dose of insulin had been given a few moments before.

In eclampsia we have found wide fluctuations in blood sugar in short intervals of time with the convulsions occurring after a sharp fall, though the actual level of blood sugar might be either below or within or even above normal ranges. This finding has now been confirmed by a sufficient number of other observers so that I believe it need no longer be questioned. For these studies it was necessary to take the readings every five or ten minutes in order to note these changes, indicating that they are abrupt changes similar to that of insulin overdosage, not slow changes as in starvation.

DR. PLASS (closing).—I began this work not with the idea of completely exploding the theory of hypoglycemia as being the cause of the toxemias of pregnancy, but of offering additional factual evidence on this problem. Dr. Van Wyck mentioned his belief that liver damage is not primary but secondary, and that while the effect of glucose therapy in protecting the liver is real, it constitutes probably a secondary objective to be attained by administering hypertonic solutions of glucose. He also emphasized the lack of value of diet in the control of the toxemias. As a matter of fact, we have for some time been treating our toxic patients with a high protein diet with excellent results, much better, we think, than with protein restriction.

I have no explanation to offer for the onset of labor in these starved individuals, but believe it may be related to acidosis. That coincides with the fact that a toxic patient becoming acidotic usually goes into labor, but whether acidosis produced by other means would produce labor I cannot tell you.

Dr. Titus mentioned the effect of starvation upon eclamptic and preeclamptic patients. I did not mention it in my paper, but toxic patients treated by complete starvation did so well that I am convinced that starvation with the development of an acidosis is good treatment for such patients. This is in conformity with my own idea that there is initial alkalosis in eclampsia and that the convulsive attacks represent protective responses on the part of the organism designed to relieve the alkalosis by a trend in the opposite direction.

Corpuscular sugar determinations should be done in future investigations.

It is quite evident that I do not agree with Dr. Titus in his belief that starvation may be a contributing factor in the development of eclampsia. On the contrary, I think it is reasonably good therapeusis to put these patients upon complete starvation.

It is difficult to discuss the question of the rapidly developing hypoglycemia because, in a series of cases such as I have dealt with, it was obviously impossible to carry out five-minute determinations over any considerable period. When, however, we can starve toxic individuals to the point of reducing the blood sugar to 30 or 40 mg. per cent, without increasing the toxic symptoms, it would seem extremely doubtful that hypoglycemia in itself is actually an etiologic factor in the development of eclampsia.

AMENORRHEA AND OLIGOMENORRHEA ASSOCIATED WITH LOW BASAL METABOLIC RATES*

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PATIENTS having low basal metabolic rates with myxedema often have menstrual disturbances; menorrhagia may be so severe as seriously to deplete the blood. Patients with low basal metabolic rates without evidences of myxedema occasionally have severe menstrual disturbances; the most common of these are menorrhagia, amenorrhea, and oligomenorrhea, and less commonly, metrorrhagia.

Desiccated thyroid gland has been used for many years in the treatment of menorrhagia and other menstrual disturbances. Since the introduction of the determination of the metabolic rate as a clinical test in diagnosis various observers have reported cases of menorrhagia and metrorrhagia associated with low basal metabolic rates in which improvement has followed the administration of desiccated thyroid.

Litzenberg and Carey found that 44 per cent of 137 women with low basal metabolic rate had menstrual difficulties, not accounted for by any pathologic condition in the pelvis. Amenorrhea is mentioned in these cases, but there are few reports of amenorrhea or oligomenorrhea associated with low basal metabolic rates. Toronczyk, in 1929, reported the cases of twelve patients with amenorrhea, aged from eighteen to thirty-nine. They were promptly benefited by taking 0.2 gm. of thyroid extract daily.

It is our purpose to report here a small series of cases in which there was low basal metabolic rates without evidences of myxedema, and in which amenorrhea or oligomenorrhea occurred, and pathologic cause could not be found in the pelvis. The series consisted of patients seen by one or both of us in the years 1930 to 1932, inclusive. The basal metabolic rates of these patients were elevated carefully, and subsequently they were carefully observed in order to make certain that the results were not influenced by other treatments.

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*Read at the Forty-Sixth Annual Meeting of the American Association of Obstetrics, Gynecology and Abdominal Surgery, Lucerne, in Quebec, Canada, September 11 to 13, 1933.

Since 1917, H. S. Plummer has recognized a large group of cases in which the basal metabolic rates were below the average normal level, but in which edema and some of the other characteristics of myxedema had not developed. Edema usually develops in cases of myxedema when the basal metabolic rate has dropped to –18 or –20 per cent. In our series of cases the basal metabolic rates were frequently as low as –15 to –20 per cent, and rarely lower than –25 per cent. Edema, and the manifestations of myxedema which are entirely or in part secondary to edema, did not occur regardless of the degree of lowering of the basal metabolic rate.

In patients with low basal metabolic rates without myxedema, deafness, slowness of recovery of the peripheral reflexes, hoarseness, slowness of mental reactions and of speech, and electrocardiographic changes are not observed except when dependent on coincident disease. The sallow skin, often resembling that seen in myxedema, is not infrequently the basis for suspecting anemia. The skin is usually dry, but not as likely to scale as freely as it usually does in myxedema. Fatigue is a common prominent feature. Gastric acids are often low, and absence of free hydrochloric acid is common. The blood cholesterol is often higher than normal, although not usually as high as in myxedema. Many patients are asthenic, and their complaints often resemble those of neurasthenic patients. A familial tendency to basal metabolic rates lower than the average normal is common, although evidence of physiologic disturbances is not apparent in all cases. The basal metabolic rates may have been low previous to the development of the illnesses; it is possible that metabolic rates somewhat lower than standard average had always been present. In the presence of low basal metabolic rates it cannot be assumed that the patient is suffering from a disease or that physiologic or pathologic disturbances are necessarily related directly to the disturbed metabolism. Menstrual disturbances are not so frequently found in association with low basal metabolic rates as to warrant the assumption of a causal relationship. The large number of such persons having normal menstrual flow, without evidence of physical or psychical disturbance, would indicate that in many instances at least the metabolic level is an individual characteristic and not necessarily an abnormality. The cases in our series corresponded in every way with the cases described. None with evidence of myxedema was included; such cases form a group in which physiologic reasons for menstrual disturbances may be quite different.

The exact relationship of the thyroid gland to menstrual function is not known. Clinical observation has shown that either an excessive or an inadequate supply of thyroxin may definitely be associated with disturbed menstrual function. The enlargement of the thyroid gland which frequently occurs during puberty, pregnancy, or the menses, and which is presumably due to an increased demand for thyroxin, may or

may not be an indication that the gland is an important factor in ovarian function. Thyroxin is essential to normal cellular metabolism, and this may be its only mode of action on the ovary. The exact interrelationship between the thyroid and pituitary glands, and the ovaries is not known, although the work of Crew and Weisner indicates that the pituitary gland may motivate the thyroid gland as well as the ovaries. Cooke suggested that the thyroid gland stimulates one or both of the sex hormones of the anterior lobe of the pituitary gland. Evidence is not at hand to show that the functional ability of the thyroid gland is in any way impaired in cases such as are included in this series, although positive proof opposing such an idea has not been obtained.

Twenty-seven patients with amenorrhea or marked oligomenorrhea were observed. The ages varied from sixteen to forty-nine years and the average age was twenty-nine and two-tenths years. Careful study of these patients failed to disclose any organic disease to which the menstrual disturbance could be attributed. The basal metabolic rates were carefully elevated under our supervision, and the results of this treatment were uncomplicated by any other treatment. Twenty-two of the 27 patients had had amenorrhea from two months to four years. Patients who had had short periods of amenorrhea had had them repeatedly. Four patients had abnormally profuse menstrual bleeding when it occurred. Five patients with oligomenorrhea noted marked reduction of menstrual bleeding as compared with their previous menstruation. Basal metabolic rates varied from –27 to –11 per cent. The distribution was as follows: in 6 cases –11 to –15; in 16 cases –16 to –20; in 4 cases –21 to –25, and in one case –27.

Basal metabolic rates were raised by the administration of an active preparation of desiccated thyroid gland administered orally each day. It was customary at the beginning of treatment to give doses of about 4 gr. daily for three or four days, and after that to drop to doses varying from 1 to 2 gr. daily. Determinations of the basal metabolic rate were made at intervals of from four to seven days, and an effort was made to find the daily dose of desiccated thyroid gland which would hold the patient's basal metabolic rate at from –5 to –8 per cent, as experience previously has shown that in most cases of this type the patients did not feel well when the metabolic rate was raised to higher levels. After a suitable dosage had been determined the patients were allowed to return home to continue the treatment with desiccated thyroid gland. The patients were observed for six months to two or three years, and during the time of treatment an effort was made to hold the basal metabolic rate at a constant level by continuous administration of the desiccated thyroid gland.

The condition of 13 (59.09 per cent) of the 22 patients with amenorrhea was improved after treatment. The improvement of most patients was marked, and the menstrual periods of 7 were reestablished to normal

intervals and in normal amounts. The longest duration of amenorrhea of any patient who was better after treatment, was one year. Thus two patients who had had amenorrhea for two and a half years each, and one who had had amenorrhea for four years, were not benefited. One of these patients was subsequently treated with theelin without beneficial result. Three of the patients who were not benefited had had amenorrhea for only six months or less. Of the five patients with oligomenorrhea, two were better after treatment, two were not helped, and one had more scanty menstrual flow. Twenty-five of the 27 patients complained of fatigue or functional disturbances, which, in many instances, had preceded the menstrual disturbances by years, and 21 of these patients expressed themselves as in better general health after elevation of the basal metabolic rate. This finding is in agreement with experience with similar treatment of a large number of patients of this type without menstrual disturbances, although in the entire group the percentage of improvement may not be so great.

COMMENT

The improvement in the feeling of well-being, and in ability to carry on normal activities with less fatigue is in itself of sufficient value to warrant continuation of this type of treatment. Furthermore, control of amenorrhea in 59 per cent of the cases makes us feel that such treatment is well worth consideration. In any condition which is prone to spontaneous remission, as is amenorrhea, it is not possible to be sure that improvement is always the result of specific treatment which has been instituted. Elevation of the basal metabolic rate should only be undertaken when the patient can be kept under observation long enough to enable the establishment of a dose of desiccated thyroid gland which will raise the basal metabolic rate sufficiently and at the same time will not subject the patient to the risk of maintaining too great an increase in the rate.

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DISCUSSION

DR. A. D. CAMPBELL, Montreal, Canada.—Both amenorrhea and continuous bleeding indicate hypoovarian function. Thyroid activity, like ovarian activity, is dependent upon the anterior lobe of the pituitary gland. In the hypophysectomized animal the thyroid undergoes rapid retrogression as evidenced by its physiologic activity as well as anatomic changes.

It has recently been shown by Dr. J. B. Collip of McGill University that the thyroid in such animals can be restored and sustained by a thyrotropic hormone isolated from the anterior lobe of the pituitary gland of certain domestic animals. These experiments have shown that such a hormone might be employed clinically.

A patient aged twenty-five, apparently normal physically, with a pulse of 54, basal metabolic rate of −18 to −26, who had had amenorrhea for five years, was given 200 rat units of thyrotropic hormone, this being injected daily for ten days. The basal rate rose to −8; weight increased 10 pounds. Menstruation occurred on the tenth day. After one more month's treatment, the patient had a second period and since that time three spontaneous menstrual cycles.

There seems some hope that similar cases might be improved therefore by stimulating the thyroid rather than by using replacement therapy.

HEMORRHAGE IN THE LATER MONTHS OF PREGNANCY*

WILLIAM B. HENDRY, M.D., TORONTO, ONT.

HEMORRHAGE plays a tragic part in connection with the vital statistics of this continent, standing as it does second only to infection and toxemia as a cause of maternal death.

In order to determine to what extent antepartum hemorrhage has affected the vital statistics of the Burnside Lying-In Department of the Toronto General Hospital, and to appraise the value and effectiveness of the treatment of that condition, a survey has been made of all such cases admitted to the public wards from Jan. 1, 1923, to Dec. 13, 1932.

These have been considered under two heads: first, placenta ablata; second, placenta previa.

The term "placenta ablata," as first suggested by Holmes, has been used in preference to the old term "accidental hemorrhage" in order to avoid the suggestion of accident or injury implied by the latter term. It has also been adopted in preference to the terms "abruptio placentae" and "placenta abrupta" employed by De Lee, which also carry with them the suggestion of force, that is, the tearing away of the placenta from its uterine attachment. Each of these latter terms leaves a somewhat erroneous first impression with the young student of medicine, that injury or force is the prime factor in the production of hemorrhage from the site of a normally situated placenta.

Of 7,448 admissions to the Burnside service during the last ten-year period there were 56 cases of placenta ablata, giving an incidence of 0.75 per cent.

In these the hemorrhage was concealed in 17, revealed in 30, and both concealed and revealed in 9 cases.

The average age was slightly over 31, while 12 were nulliparous patients and 44 parous patients. It would appear, therefore, that both age and parity must be considered when studying the etiology of the condition.

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*Read at the Forty-Sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Lucerne, Que., September 11 to 13, 1933.

Other etiologic factors were found as described in the following:

Preeclampsia	Cases 24
Eclampsia	3
Hypertension alone	3
Low reserve kidney	1
Chronic nephritis	4
Acute nephritis	1
Chronic myocarditis	1
Injury from a fall	2
Strain lifting a weight	1
Uterine fibroid	1
Unknown factors	15
Total cases	56

From the above list it will be observed that in 15 cases there were no definite etiologic factors found. In the whole series, however, there was sufficient evidence to justify the statement that placenta ablata must be considered one of the complications of the late toxemias, and might well be classified itself as one of the toxemias.

In the total series there were 44 vertex, 1 transverse and 8 breech presentations, 1 anencephalic, and 2 twin pregnancies.

In 34 cases labor started spontaneously. Nine were induced by rupture of the membranes alone and 5 by the use of the hydrostatic bag. Cesarean section was performed in three and subtotal hysterectomy in 5 cases.

In 37 cases labor proceeded normally and fairly rapidly, with spontaneous delivery, while in one case the cervix was dilated manually and extraction done with midforceps application. Manual rotation and midforceps extraction were done in 2 cases, low forceps were applied in 4 cases and podalic version with extraction was performed on 2 occasions.

The following complications and sequelae were noted:

Postpartum hemorrhage	Cases 12
Shock	10
Secondary anemia	8
Mild general infection	4
Pelvic cellulitis	2
Phlebitis	1
Ruptured uterus	1
Deaths	4

While statistics do not always mean a great deal, particularly in a small series, it is significant to note that in the present series, there were forty-eight cases treated conservatively, with three deaths, giving a mortality rate of 6.25 per cent, and eight cases treated surgically with one death, giving a mortality rate of 12.5 per cent, with a total resultant mortality rate of 7.14 per cent.

Analyzing the fatal cases it is of interest to note that Case 1 had been in the hospital two weeks with marked albuminuria and casts, high blood pressure, edema and dizziness. She was seized with sudden severe abdominal pain accompanied by shock just prior to the onset of a labor which lasted two hours and was followed

by severe postpartum hemorrhage. The uterus was packed and the patient was transfused, but she died seven hours postpartum. It is open to question as to whether or not a section might have been the procedure of choice in this case.

The patient in Case 2 was admitted to the hospital in shock. The membranes had ruptured, the cord was prolapsed, and the fetus was in the transverse position. There was moderate vaginal bleeding out of all proportion to the degree of shock. Podalic version and extraction were done, followed by severe hemorrhage from which the patient died one hour postpartum. There was a large retroplacental clot and the uterus was ruptured. It is more than probable that a section might have prevented the tragedy in this case.

The patient in Case 3 was admitted to the hospital in labor, which had started spontaneously. The first stage was uneventful, but at the beginning of the second stage she had sudden, severe abdominal pain followed by shock. Blood pressure did not register. Intravenous medication was started immediately and followed by a blood transfusion, but the patient died nine hours postpartum. A large retroplacental clot was expelled at the completion of the third stage. In this instance there was neither time nor indication for any surgical intervention as the labor ended spontaneously while the intravenous medication was being given and there was no further bleeding. The patient in Case 4 had had anuria for twelve hours and a moderate amount of vaginal bleeding three hours before admission. The uterus was found to be hard and tender.

Blood pressure was normal on admission, but the urine was reported to have shown three-plus albumin on the last examination. Cesarean hysterectomy was performed and a blood transfusion given, but the patient did not do well and died on the eighth day from paralytic ileus. In this case it would appear that a fortunate outcome might have resulted if conservative treatment had been given.

Our experience has taught us that every case of hemorrhage from the site of a normally placed placenta, whether moderate or severe, must be viewed with suspicion, and whether labor starts spontaneously or is induced, the possibility of severe postpartum hemorrhage should always be kept in mind, and preparation should always be made to control it in the event of its occurrence.

Then, too, there is the cataclysmic type of case in which the onset is sudden and accompanied by severe abdominal pain and collapse out of all proportion to the amount of visible hemorrhage, if any. The uterus itself is distended, tense, tender, and ligneous, with its walls invaded and its muscle fibers separated by an effusion of blood which always diminishes and sometimes destroys its efficiency as a contracting muscular organ. This type of case should always be dealt with surgically, and it is the surgeon's responsibility to decide whether cesarean section or supravaginal hysterectomy is the operation of choice.

Where the cesarean section alone is done, the surgeon must keep in mind the ever present danger of postpartum hemorrhage and take such measures as are necessary to combat it.

With regard to placenta previa our experience was limited to 83 cases, during the last ten year period, which gave an incidence of 1.11 per cent.

Of these the placenta was described as central in 16, marginal in 47 and lateral in 20. In no case was the placenta of the type described by Williams as placenta capsularis, but all were of the type known as placenta basalis.

Age did not appear to have any bearing on the etiology of the condition as 40 were over thirty years of age and 43 were thirty years and under, of which number 5 were under twenty years of age.

On the other hand parity seemed to have some etiologic significance, as there were only 7 nulliparas in the series, while 20 were primiparas and the remaining 56 multiparas, 17 of the latter having had from 4 to 15 pregnancies each.

None was admitted to the hospital earlier than the sixth month of pregnancy, 17 were between the sixth and seventh months, 22 were between the seventh and eighth months, and 9 were in the ninth month of pregnancy, while the remaining 35 were at term.

In 57 cases the hemorrhage had lasted less than a week and in the most of these was of only a few hours' duration. In the remaining 26 there had been bleeding for from one to twelve weeks.

In 15 cases the hemorrhage was described as mild, in 30 as moderate, and in 38 as severe.

Twenty-four were either in labor on admission or went into labor spontaneously shortly afterward. Labor was induced in 36 cases and cesarean section was performed in 23 cases.

The methods of induction of labor used in the interest of the patient were as follows:

Rupture of membranes alone	11
Rupture of membranes plus bag	13
Rupture of membranes plus pituitrin	6
Rupture of membranes plus packing	4
Packing alone	2

There were 70 vertex, 9 breech, and 4 transverse presentations in which the delivery was completed as follows:

Spontaneous delivery	34
Podalic version and extraction	11
Breech extraction	9
Manual rotation and midforceps	1
Low forceps	5
Classical section	20
Low section	3

Pituitrin was used intramuscularly in ten cases and proved to be of value in controlling hemorrhage and shortening the labor. The vagina was packed in 8 cases, and in 12 cases a blood transfusion was given.

In each of the 23 cases delivered by cesarean section, the primary indication was profuse hemorrhage. None was in labor but 9 were at term, 2 in the ninth month, 6 in the eighth, and 6 in the seventh month.

There were 3 cases of disproportion and 2 of mitral stenosis, while in 2 cases, there was profuse hemorrhage following an unsuccessful attempt at medical induction of labor.

The location and parity were as follows:

LOCATION	PARA 0	PARA 1	PARA 1 PLUS
Central	4	2	7
Marginal	–	1	6
Lateral	1	1	1

In the whole series the following complications and sequelae occurred:

Postpartum hemorrhage—	moderate	15
	severe	7
	mild	20
Fever in puerperium		12
Bronchopneumonia		2
Phlebitis		2
Pyelitis		2
Secondary anemia		1
Deaths, maternal		3
Deaths, fetal		37

The maternal death rate was 3.67 per cent.

Of the three fatalities Case 1, patient aged twenty-nine, para iii, had been bleeding for twenty-three hours and was in a state of collapse on admission. Intravenous saline was given and as the fetus was presenting by the breech and the labor well advanced, extraction was done and the uterus packed, but the patient died twenty minutes after delivery. This patient had a double placenta, all of which was in the lower uterine segment.

CASE 2.—Patient, aged forty-one, para xiv, was admitted to the hospital in labor after three hours of profuse bleeding and was in very poor condition. She was transfused, delivered by low forceps, R.O.P. face to pubis, and packed, but died three hours after delivery. She had marginal placenta previa. The uterus was found to be ruptured, due no doubt to the ill-advised use of pituitrin before admission.

CASE 3.—Patient, aged thirty-six, para ii, pregnancy at eighth month, was admitted to hospital after having had three severe hemorrhages, the last on the day of admission. A diagnosis of central placenta previa was made and a classical cesarean section done, after which the patient developed bronchopneumonia and died on the third day postpartum.

Considering the whole series in retrospect one is led to the conclusion that it is in the best interest of the patients to employ such therapeutic measures as appear to be best suited to the individual case, whether these measures are surgical or conservative, rather than to follow a cut and dried method of procedure in every case. The success or failure of such a practice naturally depends on the skill and judgment of the obstetrician.

The unsuccessful outcome of any therapeutic measure employed is not so much to be laid at the door of the obstetrician ultimately in charge of the case as it is to be ascribed to the casual manner in which hemorrhage is treated by both patients and practitioners. The patient may be bleed-

ing for weeks before reporting to her doctor, and in many cases the doctor himself is indifferent to or ignorant of the significance of the hemorrhage.

It is, therefore, important that both the public and the profession should be constantly reminded of both the significance and the danger of uterine hemorrhage in the later months of pregnancy in order that some, if not all, of the resulting tragedies may be avoided.

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DISCUSSION

DR. J. K. QUIGLEY, ROCHESTER, N. Y.—One very significant fact concerning the etiology of this condition is confirmatory of our later views as to the cause of accidental hemorrhage. Thirty-six cases showed toxemia or nephritis. I believe we will have to abandon some of the old ideas as to a short cord and trauma.

I think there is some question as to the giving of saline solution intravenously in an actively bleeding case. By slightly raising the blood pressure and by diluting the blood I think we defeat our own object. Dr. Bill's figures are very striking, but I still cannot believe that every patient should be subjected to cesarean section and I think that placenta previa cases should be individualized. I know of no condition where more judgment is required than in the treatment of placenta previa.

DR. ROBERT D. MUSSEY, ROCHESTER, MINN.—For some time we have been using for shock in connection with hemorrhage, or that which the patient may develop after having been in labor for a long time before coming to the hospital, a 6 per cent gum acacia solution, which can be kept in the refrigerator over a period of weeks, and used as quickly as saline. This solution keeps the blood pressure at a proper level for a much longer time than saline, and for a much longer time in most cases than intravenous infusion of blood.

DR. JAMES E. DAVIS, ANN ARBOR, MICHIGAN.—In one of our Detroit institutions where a number of illegitimate cases are recorded and the average residence in the institution is over four months, the antenatal care is carried on over two months and the postnatal care for a very considerable period of time. The hemorrhages and shock were distinctly less than in any other comparable group. In this group there were some 7,000 cases. This strongly emphasizes the fact that careful antenatal and postnatal care contribute much to lower the death rate and morbidity rate from this condition.

DR. A. J. RONGY, NEW YORK CITY.—The most important single sign in the study of patients who suffer from placenta previa and are bleeding actively and not in labor, is the hemoglobin index. If the hemoglobin gradually diminishes and the patient continues to bleed and is not in labor, the only safe method of treatment for the largest number of cases is cesarean section.

In all these cases the uterine cavity should be packed tightly with iodoform gauze and pituitrin should be administered directly into the uterine wall.

DR. HENDRY (closing).—We have come to the conclusion that after the ordinary methods of control have been used, the uterus should not be too tightly packed, as otherwise the use of pituitrin will not be effective.

There is no doubt in my mind that the gum acacia will raise and sustain the blood pressure much longer than other intravenous methods of medication.

I mentioned in my paper that we had two cases in which the medical induction of labor was unsuccessful. I am firmly convinced that it is a mistake in any of these cases of hemorrhage to attempt to induce labor by medical means. It is ineffective and it is dangerous. In our two cases there was profuse hemorrhage following this treatment and great waste of time.

EXTENSIVE PERINEAL DAMAGE AT LABOR*

HERBERT M. LITTLE, M.D., MONTREAL, CANADA

DAMAGE to the perineum, which is associated with practically every labor, may be sufficiently extensive as to involve the external sphincter ani and even the mucous membrane of the rectum. In my experience those lacerations which go completely through the external sphincter usually do involve the mucous membrane, and it would be more satisfactory to class those lacerations with frank bowel involvement, as "complicated tears."

The reason for this is that in an analysis of 240 cases indexed as "complete tears," I found reference to involvement of the bowel in but sixteen. Inasmuch as these 240 cases of perineal damage occurred in some 40,000 consecutive cases, it would seem that severe damage to the sphincter was evident 6 times in 1,000 cases and that the rectum was involved in but one-fifteenth of these, or 4 times in 10,000 cases. Such infrequency is probably an incorrect estimate but is in keeping with the inaccuracy of other general obstetric statistics.

The determination of cause of this serious damage is somewhat more satisfactory. My own experience comprises 39 cases, and these were frankly complete tears that involved the bowel. I have studied the reason for their occurrence; the effect, if any, on the character of the puerperium, and their ultimate result. Twenty-six of these were private patients for whom I was solely responsible, the remaining 13 being consultation cases, for which my records are less complete. Where the records are complete there is one striking factor common to all, narrowing of the subpubic angle and shortening of the bi-ischial diameter. Many years ago I drew attention to the relation of perineal damage to this shortening of the bi-ischial diameter and might again point out, as an obstetric axiom, that when the bi-ischial diameter of any pelvis equals, but does not exceed the distance between the blades of any standard forceps, then, during extraction of the head, both blades of the forceps together with the major portion of the head, must lie behind the bi-ischial line, in which event serious damage to the perineum is absolutely inevitable.

A tabulation of the bi-ischial diameters and the weights of the children in this first series of mine seems to leave no doubt that this is the case, for in practically all the mothers the bi-ischial diameter was below 9 cm. while the weights of the children show them to be far above the

*Read at the Forty-Sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, September 11 to 13, 1933.

average (Table I). The morbidity was relatively high (30 per cent), though only three patients developed a temperature of 102° or over and one in which 104° was reached, the puerperium was complicated by phlebitis and pleurisy, in spite of which the healing of the perineum was perfectly satisfactory. Of the other 13 patients, one died, this a tremendously protracted labor, infection with *Bacillus aerogenes capsulatus,* and gas infection of the fetus, which was delivered by craniotomy. Three of the twelve showed rises of temperature above 101°, one had been packed, a second had a vaginal hysterotomy, while a third had an accouchement forcè after dilatation with the Pomeroy bag. All three of these had abnormal pelves, two generally contracted and one classified as funnel. They show, however, exactly the same percentage morbidity as in the previous series, notably 30 per cent. In the larger series of

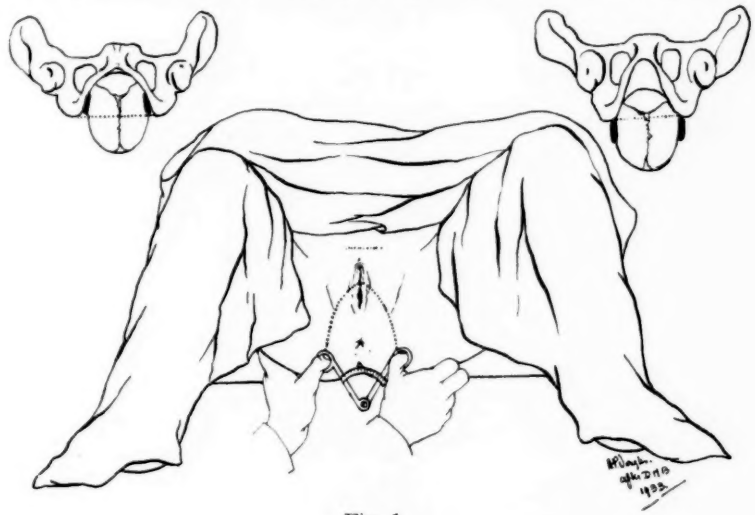

Fig. 1.

240 cases, 85 patients showed at one time or another, a temperature above 104°, i.e., 33 per cent. These figures may seem unusually high, but high morbidity, using a single rise of 100.4° as the standard, is quite in keeping with almost complete absence of definite "puerperal fever," and it is doubtful whether the injury under consideration plays much part in this matter, as in most of the 85 subsequently morbid, there was sufficient reason for expecting trouble as the result of previous manipulation. A much more important factor in the production of morbidity is the duration of the labor (Table II).

The ultimate results are for the most part excellent. In my own 39 cases, one patient died, one developed a small fistula which healed spontaneously, and in the third the wound granulated.

In the general statistics from 40,000 cases, there were 30 unsatisfactory results including 22 sinuses or fistulas of varying types. It is to be noted that a definite record of suture of the rectum was recorded in but

16 of these 240 cases, and inasmuch as two of these patients subsequently died and 11 were discharged with results marked as satisfactory, so far as the operation was concerned, even allowing for discrepancy or even grave inaccuracy in these records, it must be evident that sinus or fistula formation is not entirely dependent upon bowel involvement. Infection of devitalized tissue must have some effect, but with this is too frequently associated the burying of quantities of catgut in the body of the repair. May I suggest that this is quite unnecessary. Immunity

TABLE I

BI-ISCHIAL DIAMETER	OPERATION	WEIGHT	MAX. TEMP.	RESULT
7.0 – 7.5	M. F.	4200 gm. 2 subsequent 3880 gm. 3880 gm.	99.0	Excellent
	L. F.	2700 gm.	99.6	Excellent
	L. F.		99.8	Excellent
7.5 – 8.0	L. F.	3760 gm.	99.6	Excellent
	L. F.	3340 gm.	100.0	Excellent
	V. & E.	3300 gm.	99.2	Excellent
8.0 – 8.5	L. F.	3190 gm.	99.0	Excellent
	M. F.		100.4	Excellent
	H. F.		99.8	Excellent
8.5 – 9.0	L. F.	4200 gm.	99.8	Excellent
	L. F.	4700 gm. D. B.	100.0	Excellent
	M. F.	4170 gm.	100.4	Excellent
9 or under	L. F.	2600 gm.	100.2	Excellent
	M. F.	4110 gm. 3 subsequent 4250 gm. 5180 gm. 3960 gm.	99.2	Excellent
	Spon.	3130 gm.	100.0	Excellent
	M. F. Op.		99.6	Excellent
	L. F.	2 coils cord	100.0	Small fistula
G. C. pelvis B. I. 8	V. & E.	Ch. S. B.	99.2	
8.5 – 9.0	L. F.	3400 gm.	100.6	Excellent
8.0	V. & E.	2940 gm.	100.8	Excellent
Eclampsia	V. & E.	4080 gm.	100.8	Excellent
Eclampsia	H. F. Ch. S. B.	4250 gm.	101.0	Excellent
8.5 – 9.0	M. F.	4660 gm.	101.4	Excellent
8.0	H. F. Ch. S. B.	3880 gm.	102.0	Imperfect*
7.5 – 8.0	M. F.	suture	102.8	Excellent
7.5 – 8.0	M. F. Phlebitis Pleurisy	4100 gm.	104.0	Excellent

*Granulation due to faulty suture.

from permanent fistula formation in my cases is, I believe, due to two things: first, that no catgut save one fine strand used to bring together the ends of the sphincter, was knotted in the perineum, and second, that approximation of tissues, in other words, "splinting," with nonabsorbable material was invariably preferred to the use of buried catgut.

TABLE II

NO. CASES	TEMP.	DELIVERY	RESULT
1	105.8°	Spontaneous. No episiotomy	Granulating
6	104.5°	2 inductions 1 toxemia 3 forceps (Average time in labor—48 hours)	4 good 1 slough 1 sinus
16	103.4°	1 spontaneous. No episiotomy 8 forceps 1 uterine pack 1 manual removal placenta 1 induction 2 breech 1 craniotomy 1 perforation (Average time in labor—42 hours)	Sinus 2 died 1 from 'flu Pyelitis Mastitis Pelvic Abscess Among these 2 sinuses
18	102.3°	2 spontaneous, both complicated by mastitis 13 forceps operations 3 breeches	
		Among these the fistulas were seemingly the most frequent. In both the breeches there were fistulas, and vaginal perineal and recto-perineal fistulas followed three of the forceps operations.	
40	101.2°	Among these were 2 deaths, 7 sinuses, 5 moderately infected granulating wounds.	
4	100.5° – 101°	One of which developed a small sinus.	

After repair of the rectal mucosa, knots in the lumen of the bowel, the sphincter ends were approximated with very fine catgut and silkworm gut was then used to bring the torn or cut perineal body together

TABLE III

39 cases over 36 hr. in labor:	23 febrile, 59 per cent
Results:	21 good, 7 granulating 9 fistulas and sinuses 2 died
35 cases 24-36 hr. in labor:	15 febrile, 42 per cent
Results:	21 good, 6 granulating 5 fistulas or sinuses 1 broken down 2 not recorded

and also as a figure-of-eight to reinforce the fine catgut in the sphincter. Fine continuous catgut in the vaginal mucosa and in the skin were used practically invariably though these were probably unnecessary, the main considerations were that the tissues should not be devitalized by the

too tight tying of suture material and, second, that no attempt should be made to anchor the sphincter in the subjacent mucosa or overlying skin.

There is no special after-care of these patients. How long the bowel should be kept at rest after repair of the sphincter is a matter of individual opinion. It is my experience that there is no danger from bowel activity, except when purgatives have been administered, and that opiates are absolutely unnecessary. Restriction to fluids for the first couple of days and to a diet with small residue for about five days is no hardship. The administration of castor oil followed an hour later by the injection of 6 ounces of warm oil into the bowel is usually quite effective. If the bowel has been involved in the tear, special care should be used in the introduction of the tube used for the injection of the oil.

Equally important with the care of the bowel is the care of the bladder, for unless the first evacuation of urine after delivery is spontaneous, the slight discomfort incident to catheterization may so upset the patient that she becomes unable to void, and catheterization may be necessary for several days. This I have found a very real difficulty as the danger of cystitis and, still more, of insidious pyelitis cannot be overestimated. Where catheterization has been necessary over an extended period, instillation of mercurochrome has helped and when the patient begins to void the question of "residual urine" is very important.

The complete laceration of the perineum would seem to be essentially a matter of first deliveries. True, in one of my cases the accident occurred twice, but a reference to Table I will show that the weights of these children were exceptional. In the larger series there were 28 multiparas, though it is probable that this number should be considerably less as no account is taken of the character of the first pregnancy, some of them having undoubtedly ended in abortion. In any case, of 21 second labors in which complete tearing resulted, 4 times the accident was due to an after-coming head, and 8 times it occurred during the course of spontaneous labor. It occurred four times in the third labor, twice due to an after-coming head, once face to the pubes, and the fourth a spontaneous labor. Twice it occurred in fourth labor; each time labor was spontaneous. Once it occurred in the seventh labor, this time face to pubes.

It would seem that the repair of the sphincter renders it less likely to subsequent damage in the midline, for the original conditions do not change and there is undoubtedly quite as much stretching. Possibly the fact that the patient has had extensive damage the first time makes one more careful subsequently, for care undoubtedly is a factor in protecting the bowel. Not only is this evident from the fact that there are spots in the record where this condition occurs with unwonted frequency, but also from the fact that I have not involved the rectum since I have used

gauze to push the sphincter back when inspection would certainly suggest that extensive involvement of the bowel was quite unnecessary.

This then is the substance of the matter, that the sphincter is frequently torn during labor and when torn, if properly repaired, gives little cause for anxiety. The most probable cause for the accident is disproportion between the head and the pelvic outlet. There is no marked increase in puerperal morbidity or mortality, for the results of immediate repair, when properly done, are excellent. The development of fistulas or sinuses is not in proportion to the extent of bowel involvement, and would seem in some way associated with the method of repair. Too prolonged labor is undoubtedly a factor both in the production of damage and in the failure to heal subsequently. The after-care is as important from the standpoint of the bladder as from the bowel, and under ordinary circumstances gives little cause for anxiety.

1374 SHERBROOKE STREET, WEST

DISCUSSION

DR. LOUIS E. PHANEUF, BOSTON, MASS.—I believe that median episiotomy is essential in the prevention of lacerations of the sphincter, when a small amount of room is required. We prefer a lateral episiotomy as a rule where there is marked disproportion between the head and the outlet. In my own cases of complete laceration, I found that there were six primary tears during labor in a total of 78, the balance of them being gynecologic tears so called; that is, 7.6 per cent of primary lacerations. The healing of these tears, which I repaired immediately after labor, has been, in this small series, satisfactory. I have been in favor of suturing the rectum if the laceration in the rectovaginal septum is high. The sutures should be tied loosely. I use fine catgut in the rectum, tying the knots in the bowel lumen, and use no pressure on the sutures.

I believe in immediate repair provided no shock is present, otherwise I delay the repair for ten days. If this is not feasible I prefer to wait three months and to do a so-called gynecologic repair.

Sinus formation is a complication which one is apt to meet in primary repairs. In my own small experience, if a sinus has occurred it has healed spontaneously. Silkworm gut is advantageous in primary but is unnecessary in secondary repairs.

DR. E. J. ILL, NEWARK, N. J.—Patients are constantly coming to us who have had an immediate repair of the perineum, that is directly after birth, where the operation is a complete failure. In this regard we talk of devitalized, crushed tissue. I wish to add, edematous tissue. It seems to me very much better to wait from twenty-four to forty-eight hours before we make the repairs. The edema will have gone down, the devitalized tissue can be outlined exactly and removed. I would suggest that we do not put any catgut sutures through the mucous membrane of the rectum, but make a submucous suture. Any suture medium passing through the mucous membrane of the rectum will likely carry an infection with it. I am not very fond of buried catgut sutures in these cases. Silver wire has given me such excellent results that I wish to make no change. Twenty years ago I reported to this Society some 60 cases of this kind with perfect results. I should say that from the time of the birth of the child until the time of the operation the patient's bowels should not be moved, so as not to infect the raw tissue.

DR. IRVING W. POTTER, BUFFALO, N. Y.—I wish to talk about the prevention rather than the cure of this condition. It is our custom to prepare the birth canal, whether delivery be a spontaneous birth or whether it be by forceps, or by version and extraction. That preparation begins with first emptying the bladder by means of a catheter. Then under deep surgical anesthesia, and we recognize no such thing as obstetric anesthesia, the birth canal is dilated manually, first with one finger, then two and three and four fingers, and finally the whole hand. Sometimes it takes ten minutes and sometimes twenty. In that way the resistance in the canal is overcome, and there is far less danger of damage whether the delivery be by forceps or with an after-coming head.

There are a few things that I have never done although I have been considered radical. I never yet have done an episiotomy. I never yet have used a bag, and I have never owned a placental forceps. Episiotomy to my mind is resorted to many times when not necessary. Our prenatal work should consist of something more than blood pressures and urine examinations. If we have a chance to study our case as we should, and at the end of pregnancy we have decided whether that woman should be delivered through the birth canal or by section, and if there is a question of damage to the child from cerebral hemorrhage, or if there is a question of damage to the birth canal as extensive as has been reported, we do a cesarean section on our patients. While we perhaps do too many cesarean sections, according to the ideas of some others, yet we have none of these unfortunate conditions that the essayist reports.

DR. PAUL TITUS, PITTSBURGH, PA.—I have had occasion to do secondary repair on two of Dr. Potter's patients who had rather extensive rectoceles. It was obvious that these women had had a submucous separation of the muscles as they stated they had no tear at delivery. Perhaps it would have been better if they had had an episiotomy performed.

I believe very strongly in the efficacy of episiotomy and prefer the median incision. This follows anatomic lines of cleavage, and there is always much less devitalized tissue if an episiotomy is done in preference to permitting the patient to have a perineal tear.

There are two suggestions I would add: if the incision seems to be extending by laceration into the sphincter ani, it is a simple thing to incise further, encircling the anus and thus avoiding any definite damage to the sphincter muscle itself or to the rectum. Second, any possible damage can be minimized by stretching of the muscle if damage seems to be imminent and you prefer not to encircle the sphincter with the episiotomy.

SECONDARY ABDOMINAL PREGNANCY*

An Analysis of 16 Cases With the Report of a Case

Emmett D. Colvin, M.D., and James R. McCord, M.D., Atlanta, Ga.
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BY THE term "secondary abdominal pregnancy," we refer to the advanced form of extrauterine gestation in which the ovum continues to develop after surviving rupture or abortion from the primary site of implantation. The products of conception gradually extend into the abdominal cavity, and the placenta spreads beyond the original limits of implantation, attaching itself to adjoining structures.

From 1924 to 1933, approximately 12,000 cases of pregnancy were admitted to the Colored Division of Grady Hospital. Sixteen of these were secondary abdominal pregnancies of five or more months' gestation.

Table I. Period of Gestation

MONTHS	NUMBER	PER CENT
5	6	37.5
6	3	18.8
7	2	12.5
8	2	12.5
9	2	12.5
13 (Lithopedion)	1	6.2

AGE

The youngest of these patients was eighteen years of age, and the oldest was thirty-seven. The average age was twenty-seven.

OBSTETRIC AND GYNECOLOGIC HISTORY

Three of the women were pregnant for the first time, and 13 had been pregnant more than one time. The multiparous women had had an average of two full-term pregnancies, before the occurrence of the secondary abdominal pregnancy. Four of these multiparous women had had from one to two spontaneous abortions. In two cases the abortions preceded the secondary abdominal pregnancies.

The period of time from the last intrauterine pregnancies until the occurrence of the abdominal ones was from three to thirteen years. The average was six years.

There was a history of pelvic inflammatory disease in 13 women. Seven of these 13 women had been treated in the out-patient clinic, and

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three of them had had abdominal operations because of the pelvic pathology. The remaining three attributed past illnesses to pelvic disease.

Two women were admitted to the hospital with diagnoses of pelvic abscesses. Posterior colpotomies drained blood instead of pus. Both of these patients improved, refused an abdominal operation, signed a release and left the hospital. They were not seen again until admitted to the hospital with advanced secondary abdominal pregnancies.

Symptoms.—Pain, in the abdomen or over the tumor mass, was the chief complaint in 14 cases. One woman, near term with a living fetus, and one with a lithopedion, had no abdominal pain. The pain was variously described as severe, sharp, dull, gnawing, steady, cramping and labor-like. When labor-like, it was always accompanied by vaginal bleeding. The fetus was alive in only one patient who complained of laborlike pains.

The time of the onset of the pain was as follows:

4 weeks after last normal menstruation	4
5 weeks after last normal menstruation	5
6 weeks after last normal menstruation	2
8 weeks after last normal menstruation	5

The initial onset of pain forced 14 of these women to bed from four days to several months. Three were in bed during the entire time between the onset of pain and admission to the hospital. Thirteen were able to perform some of their daily duties during pregnancy. Four of these 13 women spent several days in bed at irregular intervals because of exacerbations of pain.

In 11 cases an abdominal mass was noticed at the time of, or within a few days of the onset of pain. Five women were pregnant for several months before a mass was found. In 12 cases the growth of the mass was described as unilateral and uniform. Nine of the women, admitted to the hospital after the death of the fetus, had observed a decrease in the size of the mass, and 6 had a lessening of breast symptoms.

Vaginal bleeding was listed as a complaint of 8 at the time of admission, and in 7 of these, the fetus was dead. Five women, complaining of vaginal spotting, stated that "fleshlike material" had appeared with the bloody discharge. The vaginal bleeding varied from a brownish mucopurulent type, to frank blood. Only 4 patients observed a bloody vaginal discharge at the time of the first pain. Five women had vaginal spotting during the acute exacerbations of pain throughout gestation. The woman with the lithopedion resumed her normal menstrual cycle after seven months of amenorrhea.

Some other symptoms were abdominal tenderness, cessation of fetal movements, bladder irritability, painful defecation, pelvic pressure, loss of weight, weakness, abdominal distention, nausea and vomiting, loss of appetite, fever, chills, and a foul taste in the mouth.

Abdominal Findings.—The abdominal mass was lateral in 13. Tenderness was noted in 12. The tenderness was localized over the mass in 7, and generalized in 5. Evidences of peritonitis were found in 5.

In only 2 cases were the fetal parts thought to lie abnormally close to the anterior abdominal wall. Fetal heart tones were heard in 7 cases. Roentgenograms of the abdomen were made in 10 cases, and in all of these the fetal skeleton was demonstrated.

In 9 cases, in which a notation was made of an effort to stimulate the mass to contract by massage, no contraction occurred. In 2 cases small doses of pituitary extract caused pelvic cramps, but no alteration in the consistency of the mass. Bartholomew feels that the administration of small doses of pituitary extract should be a most valuable aid in the differential diagnosis of an intrauterine from an extrauterine pregnancy, in an advanced stage of gestation. Braxton Hicks' contractions were not observed in any of the cases.

Pelvic Findings.—Vaginal bleeding, varying from a brownish mucopurulent type to frank blood, was noticed in 8 cases. The abdominal mass could be felt by vaginal examination in all of the cases. The cervix was displaced from its normal position eleven times. This displacement was anterior in 9, and posterior in 2. Some degree of cervical dilatation was present in 4 of the 7 women in false labor, but in no instance was effacement noted. Change in the consistency of the cervix, suggestive of pregnancy, was noticed in 10 cases.

Pelvic tenderness, especially upon movement of the cervix, was present in 12. An enlarged uterus was definitely outlined, separate from the mass, in 6 of the women.

Sedimentation Test.—The test was performed in only 6 cases. In 3 of these, slow sedimentation time of the red blood cells was of aid in differentiating the condition from an inflammatory mass.

Diagnosis.—A correct preoperative diagnosis was made in 10 of the women (62.5 per cent). In those not correctly diagnosed, the mass was thought to be a tuboovarian abscess in 3; a fibroid of the uterus in one; an intraligamentous cyst in another; and in one case the pregnancy was thought to be an ovarian cyst and fibroid uterus.

The chief cause of diagnostic errors were two: failure to obtain or to interpret an accurate menstrual history; and, the confusion of the true condition with either pelvic inflammatory disease, or a threatened premature expulsion of an intrauterine pregnancy. A careful menstrual history, suggesting tubal abortion or rupture during the early weeks of gestation, and a correct interpretation of the abdominal and vaginal findings, were the most valuable aids in the diagnosis. Fourteen of these women gave histories of pelvic disturbances in the early weeks of pregnancy, but in some them vaginal spotting at a later date was confusing.

The absence of Braxton Hicks' contractions, and the inability of the mass to respond to stimulation by contraction were most valuable aids. We feel, as mentioned above, that the administration of small doses of pituitary extract is of value in determining whether a pregnancy is intrauterine or extrauterine at an advanced stage of gestation. The presence of fetal heart tones and the visualization of the fetal skeleton by roentgenograms proved only the presence of a suspected pregnancy. The absence of fetal heart tones was, in some cases, a confusing factor.

Exploration of the uterine cavity with a uterine sound was done one time, and in this case an unrecognized perforation of the uterus occurred. In 4 cases the cervical canal was sufficiently dilated to permit a digital palpation of the uterine cavity. In 2 of these cases attempts to induce labor, before the true condition was recognized, caused the dilatation of the cervix.

Visualization of the small triangular-shaped uterine cavity and the fallopian tubes, by lipiodal injections and the roentgen ray, have made the diagnosis easy in the last 8 cases.

Operative Findings.—Thirteen of the women were operated upon. The abnormal pregnancy occurred in 8 cases on the right side, and in 5, on the left. Seven babies were alive, 5 were macerated, and one had undergone lithopedion formation. Four macerated babies had deformities of the extremities. In 7 the mass was found adherent to the parietal peritoneum of the anterior abdominal wall. The omentum was adherent to the mass in 10. In 9 the sigmoid and small intestines were adherent to the mass.

The placental attachment involved the culdesac, posterior surface of the broad ligament, the region of the ovary and infundibulopelvic ligament in 12. In only 5 of these could the fimbriated extremities of the tubes be recognized. In one, the entire pregnancy was intraligamentous. In 2 the appendix was attached to the mass. In one the sac was necrotic, and the fetus, with the cord intact, was free among the intestines.

The uterus was recorded as being enlarged and softened in 10. In 3 others the uterus showed fibroid involvement.

Complications.—Some of the complications in the series were: uterus perforated by a sound in one; uterine fibroids in 3; peritonitis in 6, only one of which was general, the remaining 5 being localized in the region of the mass. There was suppuration in the fetal sac in 2. Five patients were considered to be very poor operative risks.

Operative Treatment.—Supravaginal hysterectomy, bilateral salpingo-oopherectomy, with removal of the pregnancy mass, was done 6 times. Three of these were drained. The fetus alone was removed, the cavity packed, and the abdomen drained 5 times. In 2 the involved tube and ovary were removed with the sac and fetus, and the abdomen was drained.

Hemorrhage was controlled by packing 6 times. The abdomen was closed without drainage in only 3. The entire placenta was removed 8 times; in 5 removal was not attempted, or hemorrhage caused the operator to abandon removal and to resort to packing.

Mortality and Morbidity.—Five women died, a total mortality of 31.2 per cent. Two of the patients operated upon died, an operative mortality of 15.5 per cent. Both of these women died of general peritonitis. Three women who died were not operated upon. One died of general peritonitis, following an attempt to induce labor. One woman died, apparently of pulmonary embolism, twelve hours after lipiodol was put into the uterus. We feel that this was due to the faulty technic that was used, contrary to instructions and should not have occurred. One woman refused operation and was discharged.

The morbidity rate was 100 per cent. The fetal mortality was 100 per cent. The average stay in the hospital, following operation, was forty-six days.

CASE REPORT

M. R., gravida one, twenty-three years of age, single, had menstruated regularly every twenty-eight days. Her last menstrual period began March 21, 1931, and was normal. No flow occurred in April and May. On the third day of June, approximately eight weeks after the last menstrual period, while at work, she was seized by a sudden, sharp pain in the right lower abdomen. She fainted; vomited several times during the next twenty-four hours; and was very ill for the following two or three days. Soon after the onset of pain, she noticed slight vaginal bleeding, which continued as a scant flow for twelve days. The abdominal pain subsided slowly and caused her to remain in bed for a period of eight weeks. She then returned to work, but at no time was she free of pain in the lower abdomen, which now had become dull and aching in type.

Eight weeks after the onset of pain she noticed an enlarging, tender mass in the right lower abdomen. This mass enlarged progressively, until in October, 1931, it was midway between the umbilicus and the ensiform appendix. Fetal movements were felt the last week in August, and ceased four weeks later. After this, the mass was thought to have decreased slightly in size.

One week after the cessation of movements, she noticed a slight, bloody vaginal discharge, which continued for four days, before she began having crampy pains in the lower abdomen. With the onset of this new type of pain, the discharge became more profuse, and during the next few days, she passed several bits of "fleshlike material," which she interpreted as evidence of a miscarriage. The pains and bleeding continued for eleven days before admission to the hospital on Oct. 12, 1931.

When admitted to the hospital, she had lost seventeen pounds since March. Temperature 100° F., pulse 120, blood pressure 120/80. Hemoglobin 60 per cent, R.B.C. 3,550,000, W.B.C. 9,400. The sedimentation time was slow. The urine was essentially negative.

The abdomen was asymmetrically enlarged by a tense, slightly tender, fixed, smooth mass on the right, which extended to a level 20 cm. above the symphysis pubis. The fetal parts could not be felt and the fetal heart tones could not be heard. Although the patient was complaining of labor-like pains, the mass could not be felt to change in consistency. The round ligaments were not palpable. A smaller mass, firm, slightly tender, fixed, and smooth in outline was found in the

left lower abdominal quadrant, close behind the pubic ramus. It extended upward to a level 7 cm. above the symphysis pubis.

Vaginal examination disclosed an elongated, softened cervix, displaced to the left, close behind the symphysis pubis, with sufficient dilatation of the external os to admit the tip of a small finger. The uterus, slightly enlarged, and softened, was found to the left and anterior to the larger mass, and corresponded to the smaller mass felt on abdominal examination. The right fornix and culdesac were filled by the lower part of the larger mass, which extended downward to a level 2 cm. above the ischial spines. The fetal parts could not be felt.

Roentgenograms revealed a fetal skeleton in the larger mass. From these atypical abdominal and vaginal findings, combined with the menstrual disturbance in early gestation, it was thought that the pregnancy was of a secondary abdominal type. To confirm this, the uterus was injected with lipiodol, and another roentgenogram made. This revealed an elongated, triangular-shaped uterine cavity lying to the left of the midline and in front of the larger mass. The left tube was normal, while

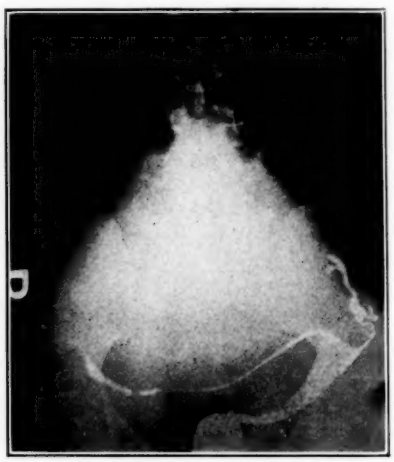

Fig. 1.—Lipiodol injection of the uterus showing triangular-shaped uterine cavity, the left tube, and the greatly elongated right tube that was adherent to the pregnancy mass.

the much elongated right tube extended across the right side of the lower abdomen, high up on the large mass, as seen in Fig. 1.

Two blood transfusions caused a marked improvement in the patient's general condition, and on Oct. 29, 1931, under spinal anesthesia, the abdomen was opened by a midline incision.

A purple, thin-walled, cystic mass was adherent to the peritoneum of the anterior abdominal wall. It was also adherent to the omentum, small intestines, the posterior surface of the right broad ligament, uterus, sigmoid and the peritoneum lining the culdesac. The uterus, softened and approximately twice normal size, was pushed anteriorly and to the left side. The left tube and ovary were normal. The right ovary, flattened out, was found densely adherent to the mass. The right tube, thinned out, was stretched for a distance of 18 cm. across the anterior upper surface of the mass. The fimbriated extremity could not be identified.

The gestation sac, intact with the uterus, right tube, and ovary were removed, leaving a large, bloody, oozing surface, which was controlled by ligatures and hot packs. The abdomen was closed without drainage.

The convalescence was uneventful, and the patient was discharged from the hospital thirteen days after operation.

DESCRIPTION OF SPECIMEN

The mass was round, with a sac wall composed of dense, fibrous tissue. The right fallopian tube, 18 cm. in length, was stretched across, densely adherent to the mass. The flattened ovary was adherent to the mass. The fimbriated extremity of the tube was incorporated into the sac wall. On opening the mass, it was found that the amnion had not ruptured and contained approximately 200 c.c. of thick, brown colored liquor. The fetus, 28 cm. in length, was extremely macerated. The cord was normal. The placenta, whose edges could not be well identified, formed that part of the sac which occupied the culdesac and posterior surface of the broad ligament. It could hardly be identified from the sac wall, except for the increased thickness near the origin of the umbilical cord, and the vessels extending across the fetal surface.

50 Armstrong Street

DISCUSSION

DR. J. W. KENNEDY, Philadelphia, Pa.—Dr. McCord referred to the tender cervix as being a very reliable sign in ectopic pregnancy. I regret that textbooks do not more forcibly bring out this sign, as it is the most reliable of physical signs of the condition and can be elicited very early, before there is any rupture. Over 50 per cent of patients sent to my hospital with an ectopic pregnancy have been improperly diagnosed. We must teach more the value of clinical history in the diagnosis of this condition.

There is an unexplained difference between the pulseless patient with ruptured ectopic pregnancy and of intraabdominal hemorrhage following surgery. In hemorrhage following abdominal surgery, the patient is active, restless, foot out of the bed, difficult to handle and has an anxious expression of impending danger, whereas the patient with intraabdominal hemorrhage due to ectopic pregnancy presents the opposite picture; quiet, resigned, indifferent to surroundings, easily nursed and shows a picture of shock.

DR. HOWARD F. KANE, Washington, D. C.—Having had four of these abdominal pregnancies in my practice, I feel that the larger a person's experience the more errors may creep in. The diagnoses in my four cases were made quite easily, and in all of them the fetal parts were felt through the abdominal wall. In each case the cervix was so high in the pelvis that it could barely be reached, and in each case the uterus was felt to be about the size of a four months' pregnancy, the fetus lying transversely above it.

Three of these four patients were negroes on the ward service; one was a private patient seen in consultation. The first patient, practically moribund on admission, died on the table. In the second one, we found the placenta so widely attached to everything that it was not disturbed and closure was made without drainage. I felt that if the placenta had caused no trouble during pregnancy, it would not cause any during the puerperium if we did not introduce infection. This patient made such a good recovery that the same treatment was given the next patient and she also made a good recovery. In the last case in removing the fetus an accident separated part of the placenta. There was no bleeding at the time, closure was made, but this patient later died of hemorrhage. Colored patients are difficult to follow but I did happen to see one of these patients four years later, and examination showed no sign of any mass. I do not know what happened to the placenta unless it was absorbed. We followed one patient for six months, and she had a large mass filling the culdesac and reaching above the symphysis.

Regarding the time at which operation should be done: three of these patients had dead babies when they arrived at the hospital, but one had a living fetus. We kept her in the hospital for three months before operating. When the fetus was

viable, we did not wait until term but operated at what we estimated to be the end of the eighth month. We felt that we did not know when possibly through degeneration of the villi, the circulation of the placenta would be stopped and that while we were sure we had a live baby we had better operate, and the result was successful.

DR. WILLIAM A. SCOTT, TORONTO, ONT.—I reported an interesting case about three years ago, and there have been previous cases reported by Dr. Asa B. Davis and several by French operators, in which the patient presented herself with abdominal pregnancy, the sac infected, and part of the fetus lying low in the pelvic cavity. In such a case if the infection is at all virulent, abdominal operation means almost certain death to the patient. In some cases it is quite feasible to remove the fetus through the posterior fornix without opening the abdominal cavity and without touching the placenta, simply leaving a large drainage. I have reported one case where the fetus had reached maturity and weighed something over seven pounds.

DR. MCCORD (closing).—Answering Dr. Kennedy's question, the diagnosis of most of these cases was made in the hospital at the particular stage of pregnancy at that time. I do not think that we saw any of these women at the time of tubal rupture or abortion. Most negro women are very stoical. The average husband of our patients has not the intelligence to give us such a history as Dr. Kennedy has suggested. Whether the cervices were sensitive in those cases with central distention of the abdomen, I do not know.

INTERPOSITION OPERATION FOR PROCIDENTIA UTERI WITH A REPORT OF 501 CASES*

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WOMAN is faultily constructed for the purpose of reproduction. She is endowed with a pelvis, which has five inches of bony structure in the posterior wall and only two inches in the anterior wall. The pelvic cavity has many curves and is not therefore an ideal receptor for a bony sphere like the fetal head. The passage way is further disturbed by the ridgelike sacral promontory, which tends to throw the axis of the fetal pole anteriorly to the transverse diameter of the pelvic inlet. Such a pelvis prevents the terminal portion of the fetal pole from being born first and forces it to undergo the maneuvers of flexion, rotation, and extension. It is inevitable that these gymnastics of the fetal pole lead to trauma of the soft structures of the birth canal.

In the process of evolution of the human species, nature neglected the transformation of the genital organs necessary to meet the requirements of the erect position. The result is that woman, though a biped, is endowed with a birth canal which is entirely unsuited for the erect position.

*Read at the Forty-Sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Lucerne, Que., September 11 to 13, 1933.

For lack of space it is not possible to publish this paper as submitted, but it will appear in its complete form in the current volume of the Transactions of the Association.

As a consequence, prolapse of the genital organs ever has tortured woman, and its cure has been a medical problem for ages.

Modern plastic gynecology dates from the excellent paper of B. Hadra, who, in 1887, before the Texas Medical Association, first described the use of the muscular fascial planes to correct uterine prolapse. For some reason Hadra's splendid presentation, though it formed the basis for all future operations for the correction of prolapsus uteri, passed by unnoticed and practically ignored. A number of years later, E. Martin published the results of his study of the muscular fascial planes of the superior and inferior pelvic diaphragms. Martin failed to give Hadra credit for his pioneer work in pelvic anatomy.

The real impetus to the interposition operation was given by Mackenrodt, who in 1892 advocated a transverse incision of the anterior vaginal wall, separating the bladder from the uterus, and slipping the uterus down and the bladder up by fixing the two structures in a new position. Dührssen refined this method and Cullen in November, 1922, demonstrated the technic anew. H. W. Crouse ironically remarked that vaginal interposition is a step by step evolutionary surgical procedure from Mackenrodt to Cullen, but credited to Watkins.

It was quite logical that, no sooner was the surgical anatomy of the parturient canal thoroughly worked out and the mechanical principles of the support of the uterus established by Hadra, Tandler, Holbein, Freund, Martin, and others, there was developed a multiplicity of operations for the correction of procidentia. Kocher, Dudley, and the Mayos advised resecting the uterus and the utilization of the broad ligaments for the support of the bladder. Crile suggested the lifting of the roof of the vagina and suturing it to the abdominal fascia after splitting the vault into two halves. There were many other procedures advocated but it was some time before gynecologists were able to evaluate properly the different methods devised for the cure of procidentia. However, it soon became apparent, that no procedure for the cure of prolapsus uteri could be of any real, permanent value unless it would include the proper correction of the prolapsed bladder.

The treatment of procidentia was in a muddled and confused state until Dührssen in 1907 enunciated the principle that any operation for the cure of prolapsus uteri must have, as a necessary element in it, the thorough loosening of the bladder from its basal connections, this producing spontaneous reduction of the cystocele, to be followed by anchoring the body of the uterus between the bladder and the vaginal wall. The uterus thus forms a cushion for the bladder and prevents a vesical hernia.

The vaginal fixation operation did not gain much favor in this country for a number of years after it had been introduced on the continent. Here and there American gynecologists reported a series of cases with favorable results.

The objections still raised against the interposition operation are: (1) that it fixes the uterus in extreme anteflexed position, (2) that it creates an unnatural position for the bladder and therefore causes permanent vesical symptoms, (3) that it is not a suitable operation of election during the childbearing period, (4) that it is technically difficult to perform and therefore a dangerous procedure in the hands of the inexperienced operator, (5) that there is too great distortion of the anatomy of the soft parts of the pelvis, (6) that patients approaching the menopause no longer require the uterus, and it is just as well to remove an offending organ.

Theoretically these seem to be important and valid objections, but in practice they can be overcome by the experienced gynecologist, for if the patients are carefully selected and the technique is properly carried out, the majority will be relieved of their troublesome and annoying symptoms and at the same time the function of menstruation will be preserved in the younger group of the patients.

During the past twenty-five years my predecessor at the Lebanon Hospital, Dr. Ralph Waldo, and I, had unusual opportunities to observe all types of ptosis of the pelvic viscera, in recent cases and cases of long standing, so-called "clean" cases and cases with extensive ulceration of the vagina and cervix, induced by irritation of mechanical contrivances, including the large cup pessary suspended from an abdominal girdle. Some of these patients required prolonged treatment in order to clear up the ulcerated areas before surgical intervention could be undertaken. The prolapsed vaginal wall, as a result of the chronic irritation, in many of these patients became greatly thickened and leathery. The dissection and separation of the tissues was difficult: in fact, it was almost impossible to find the line of cleavage between the vaginal wall and the bladder. Our experience was further increased by the fact that the racial characteristic of our patients apparently makes them more prone to ptosis of the pelvic viscera.

We studied the results obtained by us as well in patients who were operated upon in other clinics. We definitely came to the conclusion that the interposition operation is the operation of choice in the largest number of patients, and that the incidence of cure is greater by this procedure than any other method as yet devised.

There is another aspect to the interposition operation, which is generally not taken into consideration: Should the prolapse recur, the condition is not so hopeless as when a recurrence takes place subsequent to a Kocher or Mayo operation. In those cases the eversion of the vaginal vault is so complete, the tissue so thinned out, that it can no longer be repaired except by a total resection of the vagina, and this is certainly not a desirable procedure in women during middle life.

Our study is based upon 501 cases of interposition operation at the Lebanon Hospital. The first was performed by Dührssen in 1907, the

last by me in December, 1932. Of these I did 349, and 152 were performed by seven other members of the staff.

In 1917 I reported an analysis of 100 of these operations at the meeting of the American Medical Association. I then presented a detailed study of the ages and the parity of the patients and the time that had elapsed between the birth of the last child and the operation.

At that time the indications for and the technic of the operation were not thoroughly crystallized. Definite progress has been made since. It is now established that the percentage of prolapsus uteri is just as great among women, who are attended by physicians during the lying-in period, as among those who are attended by midwives; that easy labor does not prevent it and that difficult labor does not produce it. Therefore ptosis of the pelvic viscera will occur in the future as it did in the past in about the same number of women.

I propose to deal with some phase of the technic of this procedure and review the clinical course, complications, morbidity, and mortality, and the results obtained in this series of cases.

TECHNIC

The majority of surgeons still adhere to the reversed T incision as the first step in this operation. It seems to me that this is a blind way to carry out extensive dissection in an important anatomical field and also that it enhances the chances for damage to the bladder. Such an incision does not permit the dissection of the cystocele at its lowest pole and makes the separation of the anterior vaginal wall from the bladder more difficult. It prevents a thorough exposure of the field of operation; bleeding and oozing therefore cannot be controlled easily.

We have long ago abandoned the use of this incision. We have found that almost all patients, who are suffering from prolapsus uteri, have concomitant pathologic lesions of the cervix. It is either lacerated, hypertrophied, or infected, which requires its amputation either high or low. The operation is therefore begun with amputation of the cervix. Two preliminary transfixion sutures are placed in the lateral walls of the cervix. A circular amputation of the cervix is performed below the sutures. The placing of these sutures is governed by the size of the cervix and the extent of cervical tissue to be removed. The transfixion sutures serve a triple purpose. They control the bleeding from the cervical branches of the uterine arteries, prevent retraction of the cervical stump, and help to establish important landmarks during the operation.

The cut surface of the cervix is then grasped with a volsellum and pulled downward. The collar of the anterior vaginal wall will retract somewhat. The edge is then caught with two artery clamps on either side about one third of an inch from the median line, and put at tension. An incision with a knife, about one-half inch long, is made between the two clamps. The cut angles are grasped with artery clamps and everted: this brings into view the cellular tissue beneath the prolapsed bladder. Further dissection with a knife separates the anterior vaginal wall from the underlying tissue. The bladder will soon become visible. This indicates that a proper line of cleavage has been established. The separation of the bladder from the anterior vaginal wall is completed by the gauze-covered index finger. The median incision is extended as the separation progresses to about one inch below the urinary meatus. The separation of the bladder from the vaginal wall must extend laterally beyond the pubic rami, otherwise some difficulty may be encountered

in bringing the uterus forward. It will also prevent sacculation of the bladder. The bladder is now cut loose from its cervical attachment and pushed upward. This exposes the peritoneum, which is opened slightly above the internal os. The uterus then is brought forward and the bladder is pushed upward, so that it is no longer visible in the field of operation. In its new position the bladder is made to rest on the posterior surface of the uterus. The adnexa are now inspected, and if found diseased they may be removed.

Sterilization.—The modern woman does not desire to have too many children. The higher the position of the woman on the social ladder, the fewer children she will give birth to. The intellectual groups, scholars and university teachers are economically handicapped and therefore cannot afford to have many children. The result is that practically every woman belonging to the higher strata of society insists upon being sterilized during the course of the operation, after she has two or more children. Although we have a number of women who have given birth to children after the interposition operation without any untoward complications, still it has been our practice to accede to the request of the patient to be sterilized, if she had two or more children. The consent of both wife and husband is required before sterilization is performed.

The method of sterilization is by resecting the isthmal portion of the tubes, imbedding the cut ends in an everted position in the cornua of the uterus. We do not believe that extensive resection of the tubes is necessary, especially if the cut ends are everted.

The most important single step in the interposition operation is to gauge properly the fixation point of the anterior wall of the uterus to the anterior vaginal wall. If the uterus is fixed too high, it may cause undue pressure on the neck of the bladder and produce vesical tenesmus. If it is fixed too low, it is likely to produce a bearing-down sensation in the vagina.

The fixation point of the uterus depends upon: (1) the size of the body of the uterus; if it is unduly long the anchoring sutures should be placed in the middle third; this will prevent an acute anteflexion of the uterus, the bladder will rest partly on the space between the pubic arch and the upper margin of the uterus, and partly on the fundus.

(2) If the uterus is short and globular in shape, the anchoring sutures should be placed in the fundus and the bladder made to rest on the posterior surface of the uterus. The space between the pubic arch and the uterus must be obliterated in these patients; otherwise the cystocele may recur.

(3) Patients, in whom the pubic arch is low and somewhat flattened, should have the uterus fixed at a higher level than patients who have a long and well-formed pubic arch. When the uterus is fixed at a high level, it is best to interpose the peritoneum between the uterus and the anterior vaginal wall, thus preventing adhesions between the uterus and the bladder, which often cause vesical disturbances. This also should be done in patients during the childbearing period, who do not wish to be sterilized.

The majority of the patients require perineal repair. The extent of the repair will depend upon the degree of laceration and relaxation of the posterior vaginal wall. Most cases require what Roberts properly terms a deep posterior colpoperineorrhaphy. The separation of the posterior vaginal wall should be performed thoroughly. The exposure of the lateral borders of the levator ani muscles should be as high as possible. This is accomplished by blunt dissection with the finger. There is little bleeding if the natural line of cleavage is followed, which is bordered internally by the lateral rectovaginal fascia and externally by the levator ani.

The sutures drawing the levator ani muscles to the midline should be placed so that the vaginal canal will permit the introduction of the tips of two fingers at its most constricted point, otherwise sexual intercourse will be either difficult, painful, or even impossible. The statements made by some gynecologists, that the inclusion

of the greater portion of the muscular bundle of the levator ani in the interrupted suture causes subsequent pain in the perineum, is contrary to our experience, and therefore we do not hesitate to induce a reasonable amount of tension of the levator muscles by including the greater part of its structure in the sutures.

This type of posterior vaginal repair results in a vaginal diaphragm, which closely resembles the relations in the nulliparous woman. It creates a small pouch-like space above the sutured margins of the levator muscles, in which the cervix is forced to place itself because of the anteverted position of the uterus, and its excursion from the vaginal vault is prevented. Thus there is created, by this operation, two points of support for the offending organ; at the upper pole the uterus is fixed to the upper angle of the vagina, at its lower pole it is dammed by the newly created hammock in the upper part of the vaginal canal.

Suture of the lower portion of the perineum and the external skin area is completed in the usual manner. The vaginal orifice can be made larger or smaller, depending upon the particular circumstances in the case. In the elderly group of patients the vaginal orifice may be made small; in the younger group due consideration must be given to the sexual life of the patient and greater care must be taken to reconstruct the vagina in a manner, which will least interfere with the sexual function of the woman.

In suitable cases the skin wound of the perineum is closed with a subcutaneous suture. It helps to reduce the postoperative pain in this region.

Bleeding and oozing during the operation is controlled by pressure with dry sponges. Occasionally a clamp is put on a bleeding vessel, but seldom do we resort to ligation of vessels; the operation is usually completed without any ligation of blood vessels. This is easily accomplished when a proper line of cleavage is established at an early stage of the operation. It saves time and also lessens the chances for infection, because practically no foreign material is buried in the operative field.

Anesthesia.—Gas and ether were the anesthetics of election. Spinal, sacral, and local anesthesia were used when a general anesthetic was deemed inadvisable because of some organic lesion, extreme adiposity, or advanced age. We noticed a greater percentage of perineal infections in patients who received sacral anesthesia, and therefore, it is used seldom now.

Six women were operated upon without anesthesia. The procidentia in these patients was of long duration. The tissues had become indurated, thickened, and practically desensitized. The patients complained of no pain at any stage of the operation, except when dissection was begun at the margin of the perineum. We are certain that many more of these patients could be operated upon without anesthesia, if the fear and apprehension of the operation were allayed by a preliminary sedative or hypnotic.

Size and Duration of Procidentia.—The size of the prolapsed mass is no contraindication to this operation. As long as the vaginal vault is not completely everted, the interposition operation can be performed successfully. In a number of patients the prolapsed mass was easily the size of a large grapefruit. In one case the mass was so large that it could not be replaced because of a constriction above and presented many difficulties, usually not found in the average case of prolapsus uteri: The vaginal walls were greatly thickened and congested; there was much overlapping of the cystocele, practically obliterating the contour of the cervix. After a long and difficult dissection, the bladder was separated from the vaginal wall and the uterus, thus relieving the constriction. The bladder was replaced and made to rest on the posterior surface of the uterus. The perineal repair in this patient was also difficult, because of a large rectocele. In fact, the posterior culdesac was opened during the operation, because of the extremely low situation of the peritoneum on account of its having been dragged down by the heavy prolapsed mass. The result in this case was quite satisfactory. The patient was

cured of the procidentia. There was, indeed, a recurrence of the rectocele. The patient, however, was fairly comfortable. She was able to walk and attend to her household duties without much annoyance.

Fibroids and Procidentia.—We have not followed the generally accepted practice of most gynecologists, who perform vaginal hysterectomy in a case in which the prolapsed uterus contains fibroids. Vaginal hysterectomy was performed only in those patients, in whom the tumor was so situated that its removal would have destroyed the greater part of the uterine mucosa and the woman would no longer have menstruated. In cases in which the removal of the fibroid did not entail the destruction of the mucosa, the tumor was resected or enucleated, the uterine wound closed, and a vaginal fixation was performed. Wherever possible, the perineum was interposed over the incised uterine surface. The function of menstruation plays an important rôle in the life of a woman. It should therefore be preserved whenever possible. Besides, artificial menopause is not conducive to the well-being of the average patient.

Large and Congested Uterus.—In many patients, in whom the procidentia is of long standing, the uterus becomes chronically congested and unduly enlarged. Such a uterus can be interposed only in an acutely flexed position and is therefore bound to cause painful and disturbed menstruation. More recently, in these cases, we resected a wedge-shaped piece of the fundus, thus reducing the size and at the same time preserving the function of menstruation. In these patients, also, the peritoneum is interposed between the uterine wound and the vaginal wall.

Local and General Postoperative Care.—The bladder, because of its changed position and also because of having been stripped of some of its normal support, is incapable of emptying itself normally for from five to twelve days after the operation. In a number of patients a self-retaining rubber catheter was introduced into the bladder and the catheter was opened every four or five hours. This proved unsatisfactory, as several patients developed cystitis, which lasted for some time after they were discharged from the hospital.

The use of perineal pads or dressings is strictly forbidden in these patients as not conducive to asepsis and infection is often caused. The perineum is flushed with a mild antiseptic at regular intervals, especially after micturition.

The majority of patients suffer from severe pain after extensive rectocele operations. This is ameliorated by equitable doses of morphine during the first twenty-four hours. The following three days the patient is given sufficient luminal to induce a state of continuous drowsiness. When the patient emerges from her semiconscious state, she is unable to recollect what has transpired in the interval.

Previous Operations.—Secondary plastic operations on the vaginal wall are often difficult to perform as the line of cleavage is not easily established. The outline of the bladder cannot be readily defined. There is danger in these cases of perforation of the bladder wall. The dissection must be carried out at the expense of the scar tissue, searching slowly for the line of cleavage. Thirty-two patients in this series had previous vaginal plastic operations:

15 had vaginal operation for procidentia, (not interposition)
2 had a vaginal fixation operation
5 had a combined vaginal and abdominal operation
2 had a round ligament operation and a vaginal plastic
8 had a vaginal plastic; they subsequently became pregnant and gave birth to full-term children, and an interposition operation was then performed

The result in these patients both anatomically and functionally was good.

Symptomatology.—In the study of the symptoms in these series of cases an effort was made to ascertain the chief complaint emphasized by the patient and what mainly caused her to consult a physician. This classification is based according to the symptoms first mentioned by the patient.

1. Vaginal protrusion, 60 per cent
2. Urinary frequency and micturition at night, 31 per cent
3. Backache, 23 per cent
4. Leucorrhea, 19 per cent
5. Sense of pelvic pressure, 16 per cent
6. Abdominal pain, 12 per cent
7. Bleeding, 7 per cent

Many of these patients suffered from a combination of the symptoms, and the usual associated symptoms are vaginal protrusion and frequency of micturition.

RELATIVE PARITY OF THE PATIENTS.

PARITY OF THE PATIENTS	NUMBER OF PATIENTS	PARITY OF THE PATIENTS	NUMBER OF PATIENTS
Nulliparas	4	Noniparas	7
Primiparas	23	Deciparas	7
Secundiparas	82	Undeciparas	3
Tertiparas	66	Duodeciparas	1
Quadriparas	52	Tredeciparas	3
Quintiparas	36	Quatrodeciparas	3
Sextiparas	29	Septendecipara	1
Septiparas	30		
Octiparas	12	Total:	355

The parity of the remaining cases was not definitely recorded. The youngest patient in this series was twenty-three years old, the oldest seventy-eight years old.

Failure of Sterilization.—Seven patients became pregnant after they had been sterilized. One patient became pregnant four months after the operation, two became pregnant six months after the operation, one eight months after the operation, one, five months after the operation; one became pregnant after partial resection of the uterus fourteen months after the operation and miscarried in the third month; one became pregnant two years after the operation; one became pregnant a few months after the operation. In this case, however, it is not quite certain that both tubes were properly resected.

The question of pregnancy after the interposition operation is still debated by many. It is generally accepted that pregnancy following the interposition operation is not desirable, because labor is likely to be complicated in such cases and also because the operation will be undone as a result of childbirth. However, six patients who were not sterilized subsequently became pregnant. In one patient the cervix was situated high up in the pelvis; the first stage of labor progressed tediously and irregularly; she was finally delivered by cesarean section. In another patient the child was delivered by version because the head did not engage: another one was delivered with forceps, two delivered spontaneously.

Duration of Operation.—In my own series of cases the time consumed in the operation was as follows:

Vaginal fixation only	41 minutes
Vaginal fixation and sterilization	42 minutes
Vaginal fixation and myomectomy	46 minutes
Vaginal fixation and partial hysterectomy	50 minutes
Vaginal fixation and hemorrhoidectomy	43 minutes

The shortest time was eighteen minutes; the longest time was seventy-five minutes.

Postoperative Complications.—As a general rule these patients have very little postoperative reaction. There may be a rise of temperature for a few days. However, a number of patients developed some local or general disturbances. Cystitis developed in 32 cases. Twenty-five per cent of these patients had cystitis when

a retention catheter was used. Ten per cent developed cystitis after catheterization. Seven patients developed pneumonia. Six patients developed thrombophlebitis of the saphenous veins. Two cases had ascending pyelitis. Three patients developed bronchitis. Three patients had severe postoperative hemorrhage. One patient developed a vesicovaginal fistula, which healed spontaneously. One patient developed a pelvic abscess, which was evacuated by an abdominal incision; she developed a vesicovaginal fistula, which was closed six weeks later.

Catheterization.—Three hundred fifty-one patients had to be catheterized. In 40 patients a retention catheter was used. It is our experience that the retention catheter greatly annoys the patient and it is more likely to produce cystitis.

Recurrences.—Recurrence of a complete procidentia of the uterus took place in 18 patients of the 398 who were observed for a long period of time. In 23 patients there was a recurrence of the cystocele.

Recently I had the opportunity to examine a patient, who had been operated upon by me twenty-one years ago. I found no sagging of any portion of the vaginal wall; the uterus and bladder were in good position. A great number of these patients were observed for a period of from ten to fifteen years, and there was therefore ample opportunity to detect unsatisfactory results when they occurred.

The result of the perineal operations in this series of cases was not quite so satisfactory. Infection in the external part of the perineum occurred in about 20 per cent of the cases; healing therefore took place through secondary union, and it required six to eight weeks before it finally healed.

Deaths.—Five patients died, a rate of 1 per cent. Only one death occurred in my series of cases, the other 4 occurred in the services of other operators. The causes of the deaths were as follows:

1. Aged thirty-nine, developed a cerebral embolism and died one hour after the operation.
2. Aged forty-five, developed nephritis and died of uremia seventeen days after the operation.
3. Aged fifty-six, died of cardiac failure twelve hours after the operation.
4. Aged fifty-one, developed a pyelitis and died of uremia twenty-four days after the operation.
5. Aged fifty-one, went into shock toward the end of the operation and died of cardiac collapse.

All the patients had a preoperative physical examination, including blood and urine. In patients in whom a disturbed kidney function is suspected a chemical examination of the blood is made also. At present there is no adequate method of ascertaining the true function of the kidneys, which would lead a surgeon to suspect that a major surgical operation would bring on a fatal unbalance of the kidney function. In two of the patients evidently there must have been a latent organic disturbance of the kidneys, although clinical and laboratory examinations did not disclose it.

Until now the interposition operation has been limited to that group of patients who are approaching the menopause. It was assumed that childbirth following the interposition operation was contraindicated. In a large majority of cases this probably holds true. Within recent years a great change has taken place in the attitude of the average middle class woman in connection with the birth of unwished for children. Formerly when an interposition operation was contemplated, it was usually deferred until the childbearing period was over; now the average patient who has two or more children either uses a contraceptive, or has herself repaired and at the same time requests that she be sterilized.

Under such circumstances, it seems to me that a gynecologist considering the problem from a purely medical standpoint has no reason to refuse to perform sterilization. This has helped to widen the scope of the interposition operation. At present, it is being done more and more in younger women, who feel that they have had a sufficient number of children.

Many gynecologists still oppose the interposition operation. They claim that the bladder is placed in too unnatural a position and therefore cannot function properly. That there is a disturbed bladder function, temporarily, following this operation, is undoubtedly true, but this is true of any other operation thus far devised for the correction of cystocele. Sooner or later, however, the bladder adjusts itself to its new position and begins to function more normally.

The vesical disturbance associated with cystocele formation is not always due to the dislocation of the bladder. Often it is the result of a relaxed sphincter or because of a lack of proper support of the neck of the bladder. It is a well-established fact that the bladder symptoms do not always coincide with the size of the cystocele. Many patients, who have hardly any cystocele formation, complain of vesical tenesmus and frequent micturition, while others, who have large cystoceles, have very little vesical disturbance. It is always important to correctly evaluate the bladder symptoms associated with cystocele or prolapse of the uterus, before operative interference is instituted. Quite often the mere correction of the cystocele will not cure the disturbed micturition. This is exactly what takes place in many patients, in whom the interposition operation does not seem to cure the vesical disturbance. These patients require additional fascial support around the neck of the bladder or along the posterior portion of the urethra.

The criteria for the usefulness of any surgical procedure are as follows:

1. The preservation of the organs involved.
2. The anatomical correction of the dislocated organs.
3. The permanency of the operation.
4. The preservation of function.

A careful analysis of the interposition operation soon convinces one that it meets as closely as possible these criteria. No other operation corrects the displaced organs and cures the pelvic ptosis as this one does. No other operation has as yet been devised, which preserves the function as does vaginal fixation. The function of menstruation should be preserved whenever possible. Women in the fourth or fifth decade of life are greatly disturbed when they do not menstruate, and it reacts unfavorably upon them. No other operation for the correction of prolapsus uteri preserves the function of menstruation and maintains the integrity of the genital organs as well as the interposition operation.

Vaginal fixation undoubtedly offers the greatest percentage of permanent cures.

There is no mutilation of organs in connection with this operation. The integrity of practically every organ is maintained.

The interposition operation is one in which an attempt is made to correct the failure on the part of nature to construct and place the genital organs of the woman best suited to the erect position. Through the interposition operation an attempt is made to approximate the position of the uterus to that of the uterus in the quadriped and thus prevent its escape from the vaginal vault.

The interposition operation is successful because fixed structures are used for support. The uterus acts as a shelf to hold the bladder and is elevated in the pelvis by being tipped forward.

Finally, the most important accomplishment of this operation is the fact that the uterus and bladder work against each other in a way which is antagonistic to further prolapse, and in this way both the uterus and the bladder are held in a correct position.

DISCUSSION

DR. S. E. TRACY, PHILADELPHIA, PA.—The interposition operation is an excellent procedure in a certain class of cases, but it should not be used as a routine.

Patients must be thoroughly prepared and any ulcerated areas treated until healed, before the operation is performed.

Dr. Rongy states that the cure for prolapse of the uterus with complete eversion of the vaginal wall is total excision of the vagina. Such a procedure seems unnecessarily radical. After the uterus and the anterior vaginal wall have been disposed of, the vagina should be pushed up to the normal position in the pelvis and anchored to the white line on either side. Then if a good perineum is constructed the parts will remain where they belong.

DR. LOUIS E. PHANEUF, BOSTON, MASS.—In looking up 350 operations for prolapse I found that I had done 185 interposition operations. There were 9 failures due to the fact that I had interposed uteri that were markedly atrophied and too small. The atrophied uterus does not adapt itself well to the interposition operation for, although it is possible to overcome the cystocele, the large heavy bladder will again force the cervix out through the introitus. Vaginal hysterectomy with fixation of the broad ligaments is a better operation in the presence of an atrophied uterus. One condition responsible for recurrence in the posterior segment, is prolapse of the posterior culdesac. The resection of the posterior culdesac and fixation of the neck of the sac to the upper part of the vaginal tube before building the perineum will overcome this.

The success of any operation for prolapse depends on keeping the cervix well back, at right angles to the vagina. In connection with the interposition operation some shorten the uterosacral ligaments. I have placed a suture at the junction of the uterine corpus and cervix. This suture, when threaded through the anterior vaginal wall and tied, obliterates the angle at the isthmus and throws the cervix well back.

The bleeding uterus should not be interposed for two reasons; first, it is hard to expose the cervix to introduce radium after the interposition operation, and second, the performance of an hysterectomy, abdominal or vaginal, is even more difficult. The prolapsed bleeding uterus is better treated by vaginal hysterectomy.

DR. HENRY SCHMITZ, CHICAGO, ILL.—I would recommend careful examinations of the bladder, the ureters, and the kidneys, and if complications exist to clear up the infection in the urinary tract, replace the uterus by artificial means and have the patient rest in bed. I personally feel that the interposition operation is one of the most valuable of the operations for prolapse of the uterus and vagina.

DR. F. H. FALLS, CHICAGO, ILL.—It should be emphasized that in any such plastic operation one should always precede the repair by searching the uterus for malignancy. There should be a curettage, and the cervix should be studied for a precancerous or a cancerous lesion. The operation can be done very well under local anesthesia and I use it almost routinely.

In cases of first and second degree prolapse that have urinary disturbances, particularly where there is a mild incontinence, I have found that the simple interposition operation will cure the incontinence in most of the cases. There is a fibrous fixation in certain of these cases in the cellular tissue about the neck of the bladder associated with the prolapse. When the neck of the bladder is freed from the uterus any scar tissue that may be there is also freed and that releases the sphincter and the incontinence is cured or improved.

DR. RONGY (closing).—In very old patients, as Dr. Phaneuf pointed out, there is complete atrophy of the uterus, but the trouble with such cases is not the small uterus but the atrophy and the thinning out of the tissues of the vaginal vault. I distinctly recollect having operated upon a woman seventy-eight years old for complete prolapse of the uterus. The vaginal vault was so attenuated that the procidentia recurred six months later.

Dr. Schmitz raised the important question of the cystitis found in a number of these patients as a concomitant condition. Curiously enough, I have catheterized many of these patients who suffered from long-standing prolapse of the uterus, and found no residual urine. We have also cystoscoped many patients after they had been operated upon, in order to study the position of the bladder, and they had very little residual urine. Furthermore there is an apparent increase in the capacity of the bladder. Dr. Tracy thought that 20 per cent infection of the perineum is too large a percentage. Under this heading we included every patient who had the slightest infection of the external sutures.

I believe that a pad which covers the rectum and a fresh perineal wound is not conducive to primary union in that wound. There is no necessity for any vulva pads in these cases. I do not hesitate to introduce radium during the operation in patients who give a history of irregular bleeding. In two such cases I introduced radium into the cervix with no untoward effects.

The rectocele in these cases should be treated very carefully. If only an ordinary perineal operation is performed, the rectocele may not be cured. It is necessary in these patients to make a complete and high dissection of the posterior vaginal wall and expose the levator ani muscles as high up as possible. To my mind, this is one of the most important steps in the interposition operation, particularly in elderly women who have a relaxed posterior vaginal vault.

Usually there is sufficient pathology in the cervix to warrant its amputation. Occasionally, in elderly patients, the cervix may not be the seat of much disease and therefore is not removed. The removal of the cervix helps to reduce the congestion of the uterus, therefore decreasing its size. As a result of that the sagging of the uterus is likely to be less.

Dr. Davis raised an important question and I agree with him that this is not an operation for a young surgeon, no matter how good a general surgical training he might have had. The interposition operation should be done by an experienced operator or one who has assisted frequently at such operations.

PRENATAL CARE IN PRIVATE AND CLINIC PRACTICE*

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(Associate Professor of Clinical Obstetrics and Gynecology, Washington University School of Medicine)

ROUTINE blood pressure readings in pregnancy are habitually stressed, yet the actual meaning is rather indefinite. Most statements regarding their significance are more or less generalities and unsupported by statistics.

With the hope of adding something to our clinical knowledge, I am submitting the highest blood pressure readings in the three trimesters of pregnancy from my last 2,000 consecutive private deliveries and also from 2,000 consecutive clinic patients delivered in the St. Louis Maternity Hospital of the Washington University School of Medicine. Deliveries prior to viability are not included in this series.

In the private group there were 3 maternal deaths (0.015 per cent); one from hemorrhage due to a central placenta previa; one from a hemolytic streptococcus septicemia in a patient who delivered precipitately in bed thirty-six hours after the spontaneous premature rupture of membranes. The third death was reported as caused by delayed chloroform poisoning. The three deaths occurred in multiparas.

The relatively small number of clinic patients appearing in the first trimester is due to the common practice of such individuals in applying for prenatal care later in pregnancy.

Many complicated cases were referred to the clinic near term, having had little or no prenatal care. When such care was given, the results obtained were practically as good as those obtained in the private group.

The prenatal care employed, consisted in stressing an abundant fluid intake; avoidance or control of constipation; a diet of high carbohydrate, moderate protein and low fat, also a low salt intake. Patients with increasing blood pressure were restricted still more and greater emphasis placed upon avoidance of constipation and undue fatigue.

In the private group, all patients with basal metabolic readings of –10, with or without symptoms and those with –5 or more with symptoms were given thyroid extract, enough to hold the basal pulse rate between 70 and 80; the dose required was usually about 1 grain daily for each –10. In the private group where routine basal metabolic readings were taken on the last 500 patients, 61 per cent of the total number showed readings of –5 or more. A similar reading was present in 76.9 per cent

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of the so-called toxemic group, with a blood pressure of 150 or more. In this latter group, 18 per cent had readings of plus 5 or more while 5.1 per cent had 0 readings. This would seem to indicate that a low basal metabolism is more frequently associated with toxemia. This point

TABLE I. SHOWING THE AVERAGE HIGHEST BLOOD PRESSURES ACCORDING TO THE TRIMESTERS OF PREGNANCY FOR 2,000 CONSECUTIVE PRIVATE AND 2,000 CONSECUTIVE CLINIC PATIENTS

	FIRST TRIMESTER		SECOND TRIMESTER		THIRD TRIMESTER	
PRIVATE	NUMBER	AVERAGE B. P.	NUMBER	AVERAGE B. P.	NUMBER	AVERAGE B. P.
Primipara	535	120/69	778	122/70	865	131/79
Multipara	613	120/69	1,017	121/69	1,135	128/74
CLINIC						
Primipara	229	114/68	644	118/68	1,131	125/75
Multipara	59	117/70	463	117/70	869	126/76

is interesting because thyroid inactivity has often been suggested as a cause of toxemia.

Considerable fluctuations occurred in both systolic and diastolic blood pressure readings, although less marked among the latter. Table I

TABLE II. SHOWING BLOOD PRESSURE RANGE DISTRIBUTION GROUPED IN TRIMESTERS FOR 2,000 CONSECUTIVE PRIVATE AND 2,000 CONSECUTIVE CLINIC CASES

PRIVATE	TO 100	100 TO 109	110 TO 119	120 TO 129	130 TO 139	140 TO 149	150 TO 159	160 TO 169	170 TO 179	180 TO 189	190 TO 199	200 +
Prim.	%	%	%	%	%	%	%	%	%	%	%	%
First (535)	2.2	14.5	30.0	29.9	14.0	6.5	1.3	0.37		0.18		
Second (778)	1.1	7.8	31.7	34.0	17.4	4.7	2.1	0.12	0.38	0.25		
Third (865)		2.1	15.0	33.9	28.2	11.6	4.6	1.5	1.6	0.5	0.11	0.46
Mult.												
First (613)	2.9	14.1	32.6	30.0	14.7	6.5	0.16	0.49	0.32			
Second (1,017)	14.0	11.3	31.1	31.4	13.2	9.3	0.98	0.6	0.09	0.09	0.09	
Third (1,135)	0.3	4.4	19.2	33.8	25.0	10.3	4.2	0.8	1.3	0.08	0.16	
CLINIC												
Prim.												
First (225)	3.9	24.8	37.1	25.3	6.1	2.6						
Second (636)	2.3	14.5	38.1	29.3	11.1	2.4	0.62	0.31				0.15
Third (1,131)	0.4	9.0	24.7	33.1	18.7	7.3	3.8	1.5	0.4	0.2		0.4
Mult.												
First (57)	1.6	15.2	32.1	35.5	13.5	1.6						
Second (454)	1.5	14.0	31.7	33.8	13.8	3.6	0.6	0.4	0.2			
Third (869)	0.6	6.6	22.3	33.6	20.5	8.6	3.2	1.7	0.9	0.3	0.5	0.5

shows the average highest blood pressures according to the trimesters of pregnancy and demonstrates that parity exerts no appreciable effect upon blood pressure. Private patients had slightly higher blood pressures than the clinic group in all trimesters. Blood pressures tend to rise in the last trimester, being slightly greater in primiparas than multiparas in the private group and practically identical in the clinic group. The private group fails to bear out the common statement that a systolic pressure of 130 or more is abnormal in pregnancy.

Table II shows the blood pressure range distribution grouped in trimesters from among 2,000 consecutive private and 2,000 consecutive clinic patients according to trimesters.

Table III shows the effect of age upon blood pressure. Elevations occur most often in the age group of forty or more. These patients had blood pressures of 150 or more at least in one and may have had lower blood pressures in the other trimesters.

The frequency of blood pressures of 150 or more according to age groups is demonstrated in Table IV. This shows a marked rise in the percentage of hypertensions in the fourth and fifth decades.

TABLE III A.—SHOWING BLOOD PRESSURE RANGE DISTRIBUTION GROUPED IN TRIMESTERS IN CASES WHERE BLOOD PRESSURE WAS 150 OR MORE

PRIVATE	TO 100	100 TO 109	110 TO 119	120 TO 129	130 TO 139	140 TO 149	150 TO 159	160 TO 169	170 TO 179	180 TO 189	190 TO 199	200 +	AGE GROUP
Prim.													
First Trim.													
Second Trim.													
Third Trim.							1						
Mult.													
First Trim.													
Second Trim.													
Third Trim.													Up to 20 years
CLINIC													
Prim.													
First Trim.		1		1									
Second Trim.			3	4		1	2						
Third Trim.							9	9	3	2	1		
Mult.													
First Trim.													
Second Trim.				1									
Third Trim.						1							
PRIVATE													
Prim.													
First Trim.		2	3	3	9	6	3	1					
Second Trim.			3	9	9	8	10		2	1			
Third Trim.				1			26	9	10	4	1	4	
Mult.													
First Trim.				5	1	1	1	1					
Second Trim.			2	6	5	5	3	1					
Third Trim.		1					13	3	4				20 to 29 years
CLINIC													
Prim.													
First Trim.			2	2									
Second Trim.	1		4	11	10	5	3	2		2			
Third Trim.					1	3	30	12	6		1	5	
Mult.													
First Trim.				1									
Second Trim.	1		3	8	4	1	2						
Third Trim.						1	16	10	4	1	2	1	

Table V shows the frequency of infections revealed in the past history of 364 patients with a blood pressure of 150 or more. Probably the number is considerably greater because many patients were unable to recall any illness occurring in childhood.

In Table VI are shown the symptoms in 5 private and 13 clinic patients with convulsions. Less than half showed any striking urinary change; a scanty output being the most marked sign. Edema, headaches, blurring vision, and nausea and vomiting in the latter half of pregnancy were important, yet insomnia and restlessness, often alternating with drowsiness, occurred most frequently.

Table VII shows the eclamptic group of 5 private and 13 clinic patients with convulsions out of the total 4,000.

It is remarkable that the only death from eclampsia occurred in one clinic patient who had had no prenatal care.

TABLE III B.—SHOWING BLOOD PRESSURE RANGE DISTRIBUTION GROUPED IN TRIMESTERS IN CASES WHERE BLOOD PRESSURE WAS 150 OR MORE

PRIVATE	TO 100	100 TO 109	110 TO 119	120 TO 129	130 TO 139	140 TO 149	150 TO 159	160 TO 169	170 TO 179	180 TO 189	190 TO 199	200 +	AGE GROUP
Prim.													
First Trim.			2	5	1	1	4	1		1			
Second Trim.		3		6	6	4	3	1	1				
Third Trim.							13	4	4	1			
Mult.													
First Trim.			4	5	5	9		2	2				
Second Trim.		3	4	8	10	8	7	3	1	1	1		
Third Trim.					1	1	25	7	8	1	2		30 TO 39 YEARS
CLINIC													
Prim.													
First Trim.								2					
Second Trim.				1									
Third Trim.								5			1	2	
Mult.													
First Trim.				3	1	2		2					
Second Trim.				2	4	5			1		1		
Third Trim.							13	6	5	3	2	4	
PRIVATE													
Prim.													
First Trim.													
Second Trim.										1			
Third Trim.					1		3						
Mult.													
First Trim.				1		1							
Second Trim.				1	2	2		2					
Third Trim.							5	2	2				40 YEARS AND OVER
CLINIC													
Prim.													
First Trim.													
Second Trim.					1								
Third Trim.								1				1	
Mult.													
First Trim.													
Second Trim.				1		1							
Third Trim.							1	2	1			2	

CONCLUSIONS

1. Routine blood pressure readings during pregnancy and the early puerperium are important, yet are not sufficiently conclusive as shown by the occurrence of convulsions two and one-half hours after a blood

TABLE IV. SHOWING FREQUENCY OF BLOOD PRESSURE OVER 150 TABULATED ACCORDING TO AGE GROUPS

AGE GROUP	PRIVATE CASES				CLINIC CASES				TOTALS		
	PRIMIPARA		MULTIPARA		PRIMIPARA		MULTIPARA				
	NO.	150+	NO.	150+	NO.	150+	NO.	150+	NO.	150+	%
Up to 20 yr.	29	1	7	0	382	24	45	1	463	26	5.6
20 to 29 yr.	637	54	590	20	667	54	501	34	2,395	162	6.7
30 to 39 yr.	187	22	511	46	78	8	289	33	1,065	109	10.0
40 and over	12	4	31	9	4	2	30	6	77	21	27.0

TABLE V. SHOWING PAST HISTORY OF VARIOUS INFECTIONS IN 144 PRIVATE AND 124 CLINIC PATIENTS WITH SYSTOLIC BLOOD PRESSURES OF 150+

	PRIVATE		CLINIC		
	PRIM.	MULT.	PRIM.	MULT.	TOTAL
Appendicitis	14	7	5	1	27
Arthritis	2		1		3
Cardiac			3	4	7
Cholecystectomy	1	1			2
Chorea		2			2
Dental caries	2	2	1	2	7
Diphtheria	2	1	5	4	12
Erysipelas				1	1
Frequent colds	6	5	4	3	18
G.C. Bartholinitis			1		1
Goiter, toxic	2		1	2	5
Hypertension			2	3	5
Influenza	11	5	9	1	26
Lues	1		5	3	9
Malaria	2		1		3
Measles	22	13	18	11	64
Meningitis		2			2
Mumps	12	8	13	5	38
Myoma (dystocia)	3	5	2	2	12
Nausea and vomiting			1		1
Nephritis			3	3	6
Obesity			1		1
Obstipation	2	1			3
Pertussis	13	6	11	3	33
Pneumonia	4	7	1	1	13
Poliomyelitis	1				1
Previous eclampsia				1	1
Pulmonary Tbc.				1	1
Pyelitis	7	4	2	2	15
Scarletina	9	9	5	1	24
Septic infection	1			1	1
Thyroidectomy			2	1	3
Tonsillectomy	15	11	6	2	33
Tonsillitis, ch.	18	7	2	3	30
Typhoid	7	1	2		10
Varicella	10	7	6	2	25
Variola			2	4	6
No history			28	20	48
Past history neg. (never ill; always healthy)			6	6	12
Usual childhood diseases (not specified)	27	12	7	8	54

TABLE VI. SHOWING SYMPTOMS OF WHICH 5 PRIVATE AND 13 CLINIC PATIENTS WITH CONVULSIONS COMPLAINED

	PRIVATE		CLINIC		
	PRIM.	MULT.	PRIM.	MULT.	TOTAL
Blurring vision	3	1	5	2	11
Constipation	3	1	2	1	7
Dizziness	3	1	4	4	12
Drowsiness	3	1	4	4	12
Epigastric pain	3	1	4	1	9
Headaches	3	1	6	4	14
Insomnia	3	1	2	1	7
Nausea and vomiting	3	1	5	1	10
No symptoms	1		1		2
Edema	1	1	7	1	10
Restlessness	3		4		7
Urine:					
a. No change	1			1	2
b. Scanty output	3	1	4	1	9
c. Abundant output	1		1	1	3
d. Trace of albumin	1		1	1	3
e. Cloud of albumin	2	1	5	2	10
f. Pyuria			1		1

TABLE VII. ECLAMPSIA IN 2,000 CONSECUTIVE PRIVATE CASES. ECLAMPSIA IN 2,000 CONSECUTIVE CLINIC CASES

PRIVATE CASES

HISTORY NUMBER	AGE	GRAV.	TIME UNDER OBSERVATION	B. P. ON 1ST VISIT	GESTATION AT DELIVERY	DEAD OR LIVING	PRENATAL CARE
495	33	iii	2/17 to 3/6	165/90	33 wk.	L.	Inadequate
1103	29	ii	10/21 to 5/15	102/78	31 wk.	L.	Fair (uncooperative)
1568	38	i	11/13 to 6/22	160/90	40 wk.+	L.	Good
2151	21	i	6/3 to 7/12	120/60	31 wk.	L.	Inadequate
2329	28	i	3/8 to 9/6	120/66	36 wk.	L.	Good

CLINIC CASES

HISTORY NUMBER	DEAD OR LIVING	DATE OF ADMISSION	DATE OF DELIVERY	NO. VISITS IN CLINIC	BLOOD PRESSURE FIRST VISIT	PRENATAL CARE
10559	L.	2/ 6/31	2/10/31	0	170/132	None
11808 (Mun.)	L.	4/23/31	7/22/31	6	128/82	Good
11945	L.	3/29/31	7/24/31	4	132/80	Inadequate
12877	L.	10/30/31	10/30/31	0	130/80	None
13491	L.	9/10/31	1/24/31	5	108/58	Good
13492	D.	1/24/32	1/28/32	0	184/110	None
13820	L.	1/18/32	3/ 8/32	5	130/78	Good
13899	L.	2/29/32	3/28/32	3	140/110	Fair
14178	L.	5/ 3/32	6/ 2/32	0	168/120	None
14950	L.	8/21/32	8/22/32	0	204/132	None
14986	L.	4/25/32	9/ 8/32	6	124/86	Fair
15354	L.	10/11/32	10/17/32	0	190/130	None
15738 (Mun.)	L.	8/18/32	12/16/32	8	90/48	Good

pressure of 102/54. Although it has been impossible to prevent convulsions in all cases, yet they have been less severe and without maternal mortality in individuals receiving prenatal care in this series of 2,000 consecutive private and 2,000 consecutive clinic patients delivered. The progressive steplike increase in blood pressure is very significant, especially when associated with other evidences of toxemia (edema, diminished urinary output, albuminuria, etc.).

2. Weight gain per se was disregarded in these 4,000 patients except for cosmetic reasons. Many of the most normal cases had the largest gains in weight, while only one of the private patients with fits had marked edema. It is felt that any pronounced gain in weight is a result rather than a cause of the toxemia.

3. Urinary findings alone, while helpful, are not sufficiently conclusive evidences of the patient's true condition. Although all showed albuminuria, casts, etc., *after* convulsions, only slightly more than half of the clinic patients and 2 of the 5 private patients with convulsions had more than a trace of albumin or casts *before* convulsions.

4. Blood chemistry findings were of little value in cases of eclampsia.

5. Edema was present in 56 per cent of the eclamptic group, which is but little greater than among the nontoxic cases; however, the edema was more marked in cases of toxemia.

6. Dizziness, epigastric pain, headache, blurring vision, nervous irritability, whether restlessness or stupor, together with nausea and vomiting in the last trimester of pregnancy are considered grave symptoms, especially when combined with elevated or steadily mounting blood pressure and scanty urinary output.

7. All factors must be considered and evaluated and in the final analysis, we may be forced to rely upon our clinical instinct: to heed all but not rely solely upon any single source of information, to determine what is the patient's actual condition and how best to treat it.

3720 WASHINGTON BOULEVARD

DISCUSSION

DR. PAUL TITUS, PITTSBURGH, PA.—Dr. Royston's observation that increase in blood pressure without renal disturbances is not a reliable warning sign of impending toxemia, minimizes the importance of one sign that we have depended upon to warn us of impending trouble. Dr. Royston's figures seem to show quite conclusively that these symptoms are secondary results of the toxemia although the actual existence of the toxemia may still be unrecognized. However, the unsual exceptions that were cited by him such as the case of eclampsia that developed after a blood pressure reading of only 102, would probably not make him wish to advise us to discard these routine procedures that we have depended upon so long, such as routine urinalyses, blood pressure readings, etc.

With many of these symptoms it is the suddenness of their appearance that is of most importance. While it may be true that the number of weight takings in a series of patients does not indicate anything one way or the other where a large

group is considered, in studying an individual case which is going along with an average weight gain, a sudden increase in weight becomes a sign of advancing toxemia.

One observation which seems to be of the greatest importance is the frequency of low basal metabolic readings in toxemia. That is consistent with the growing belief that toxemia of pregnancy is a metabolic disturbance. It is thought that low basal metabolic readings and low blood pressures are associated, but if this is true, as has been believed for a long time, then increase in blood pressure may also be a secondary symptom and a protective measure.

DR. E. D. PLASS, IOWA CITY, IA.—Continuing Dr. Titus' suggestion that possibly the symptoms of eclampsia or of toxemia are actually the result of protective mechanisms, I would add that this seems perfectly reasonable. Would it not be easy to explain Dr. Royston's findings of no adequate symptomatology in those patients, who developed eclampsia, on the lack of development of a protective response and of signs of toxemia incident thereto? It seems that such a point of view is perfectly logical, if we believe that the symptoms are simply the result of an effort on the part of the organism to protect itself against the unknown hypothetical alteration, which leads to the development of the intoxication.

DR. JAMES K. QUIGLEY, ROCHESTER, N. Y.—In listening to Dr. Royston's paper I met with two surprises: first, as to the mean average blood pressure in the first trimester. I find that in many of my patients it is below that given by Dr. Royston. Second, is it not the rise in blood pressure that is significant and not the blood pressure per se? If the patient has a rise of 15 to 20 points, is not that of more significance than a blood pressure relatively high throughout pregnancy?

Another surprise was the lack of significance of rapid weight gain. Even though this may be the result of toxemia, is it not one of the first symptoms of toxemia before the other symptoms develop?

DR. JAMES R. BLOSS, HUNTINGTON, W. VA.—My experience certainly differs from that of Dr. Royston as 80 per cent of my patients ran a blood pressure below 120; about 50 per cent ran a systolic blood pressure below 110. I have found that a more dangerous signal than the high systolic pressure is a gradually increasing diastolic pressure. If the diastolic pressure keeps creeping up the patient is becoming toxic. Basal metabolisms are taken as a part of the routine in our prenatal work and I have found that practically every one of these cases of early pregnancy with nausea and vomiting has a low basal metabolism. My experience with the amount of thyroid required to benefit these patients is that it takes about a quarter or a half grain per day. Thyroid is given immediately on waking in the morning, on an empty stomach and with just a sip of water. It was astounding to me how many cases of marked vomiting were improved by the administration of thyroid in this manner.

The urinary findings are certainly of value, but there will be many of these patients without any urinary findings who have marked vomiting, and I regard that as a serious condition. Occasionally I have found that in the very marked cases of nausea and vomiting in the first trimester a small dose of thyroxin given intravenously has proved of marked benefit.

DR. JAMES E. DAVIS, ANN ARBOR, MICHIGAN.—In studying tissue changes that take place in a progressive way in the toxemias of pregnancy, one has difficulty in following the details of these changes, because at first they are very gradual and difficult to recognize. Autopsy material from cases of pernicious vomiting of pregnancy may or may not reveal very much on microscopic examination. However, where the tissue examinations are at all satisfactory one may find quite definite changes in the endothelium, not in all the vessels but sometimes distributed irregu-

larly throughout the entire vascular system. Closely allied with this one finds degenerative changes in the tubular portions of the kidney which have been designated as nephroses. These changes are not always present, and they are generally described as being connected with the more profound toxemias but not necessarily.

DR. A. J. RONGY, NEW YORK CITY.—I believe that before abnormal laboratory findings appear there are clinical symptoms which would indicate that the patient is beginning not to do well. What are these early clinical symptoms? Loss of appetite, general malaise, tired feeling, sleeplessness, slight headache, and epigastric pain are the symptoms which indicate that the metabolism of the patient is undergoing some changes. The laboratory signs, like a rise in blood pressure, appearance of albumin in the urine, changes in the blood chemistry, and slight edema appear somewhat later and are due to already existing metabolic changes. The time to begin to treat these patients is when early clinical symptoms appear, and in that way only eclampsia can be prevented.

DR. ROYSTON (closing).—I did not mean that blood pressure readings, urinalyses, weight takings, etc., should be abandoned, but that they alone were not highly reliable indices of the patient's condition; that we must view the patient as a whole. We must look further and correlate clinical and laboratory findings.

THE FRIEDMAN PREGNANCY TEST*

FRANK SPIELMAN, M.D.,† NEW YORK, N. Y.

(From the Gynecological Service and Laboratories of the Mount Sinai Hospital)

EVER since Friedman induced ovulation with corpus hemorrhagicum and corpus luteum formation in the ovary of the rabbit by the injection of urine from pregnant women, many reports of its efficacy as a pregnancy test have appeared

The results of 635 tests on rabbits with the Friedman test at the Mount Sinai Hospital are here recorded. They comprise 305 cases from the ward service and 330 private cases, in all of which the clinical diagnosis of pregnancy was in doubt. In most of the cases the test was performed in order to determine the presence or absence of gravidity in the normal uterus. There were also included cases in which the pelvic condition offered difficulty in diagnosis. Besides its use as an indicator of normal intrauterine pregnancy, attention is called to the value of the test in the diagnosis of ectopic gestation and missed abortion.

TECHNIC

A fresh specimen of urine usually not catheterized, preferably collected in the morning, is employed. It is to be kept on ice while not in use. It is injected intravenously in 5 c.c. quantities morning and afternoon into each of two mature, female rabbits until 4 injections have been given. No sterile precautions are neces-

*Read at the meeting of the Section on Obstetrics & Gynecology, New York Academy of Medicine, March 28, 1933.

†Herbert L. Celler Foundation Fellow.

sary. Forty-eight hours after the first injection the ovaries of the rabbits are examined for the characteristic changes, either by autopsy or operation. In the typical positive reaction the ovaries are seen to contain large hemorrhagic follicles, the color of which varies from a light red to blue-black. They may be ruptured or unruptured and are usually multiple. The negative ovary usually contains ripe follicles but these are colorless. The diagnosis is, as a rule, easily made with the naked eye, neither section nor even a hand lens being necessary.

In carrying out this technic, the following points are stressed:

1. The urine must be kept on ice. Urine allowed to stand at room temperature quickly becomes toxic and this often results in the sudden death of the animals immediately after injection. Shaking with ether before use does not help materially.

2. A total of 20 c.c. of urine injected over forty-eight hours in 5 c.c. doses twice a day affords maximum efficiency. Magath and Randall, Wilson and Corner, Brouha, and others use from 5 to 15 c.c. given in one or two injections. Although these quantities are sufficient to produce the reaction in positive cases, the corpora hemorrhagica stand out more clearly and definitely with the larger doses so that the readings are more easily made.

3. The rabbits should be mature. As Schneider has shown immature animals do not react well enough to give satisfactory results. In some of the cases here reported, immature animals were used and found to be wholly unreliable when checked with mature ones. The minimum weight is 1.8 kilograms, and the age three months. Those which have dropped litters react best.

4. The rabbits should be isolated for thirty days. This insures the disappearance of old corpora hemorrhagica and corpora lutea as well as the prevention of pregnancy before use. In this respect it may be noted that even in the presence of pregnancy in the rabbit the fresh corpora hemorrhagica in a positive case may stand out clearly enough to be unmistakable. Correct readings have repeatedly been made in the presence of gravid uteri or old corpora hemorrhagica.

5. Readings should be made after forty-eight hours. It is true that good results have been reported after only sixteen to twenty-four hours by Wilson and Corner, and Reinhart and Scott. Nevertheless, the optimum time seems to be forty-eight hours (Friedman and Lapham). Dodds reports six errors in 20 cases using 8-12 c.c. of urine and examining the animals in from fifteen to twenty-four hours.

6. Two rabbits should be used. As Ehrhardt points out, diseased rabbits often do not react. Besides, a second rabbit serves as a check. Fully 22 positive cases of the 635 reported showed a negative reaction in one rabbit. Another advantage of using two rabbits is that where speed is necessary one may be killed in thirty-six hours. Twenty-four-hour results in this series have not been reliable.

From a survey of the literature as well as personal experience, it may be stated that rigid attention to the above technic will give the best results.

RESULTS

Diagnosis of Normal Pregnancy.—Most of the 635 tests fall in this category. Only 3 failures are recorded. In each of these a negative reaction was subsequently found to be positive on repetition of the test. Since 330 cases were private and could not be followed up by us, it must be admitted that more errors may have been present in this group. The ward cases, however, served as an adequate criterion. As has been stated previously, in 22 positive cases one rabbit of two used for the test showed a negative reaction. The only explanation that can be offered for the

failures is that almost all rabbits used were "discards," that is, had already been utilized in other departments of the laboratories, usually the bacteriologic. These were often sick before the test was begun, undoubtedly a factor in the failures.

Ectopic Pregnancy.—The test was performed repeatedly in cases in which ectopic pregnancy was suspected. There were 16 cases proved by laparotomy. The Friedman test was positive in 11 of these and negative in 5. In 4 of the negative cases, however, the pregnancy was either old with nonviable chorionic tissue, or there was complete absence of villi on microscopic examination. The fifth showed fresh villi but suggested an old process. The importance of viability of the tissue has also been noted by Wilson and Corner, and Wladika. The former report 6 cases of ectopic pregnancy of which 3 gave a positive Friedman test and 3 a negative. In none of the negatives was living fetal chorionic tissue found. Wladika, using the original Aschheim-Zondek method, obtained positives in 8 of 12 pregnancies. He also found that the chorionic tissue was degenerated or absent in the negatives. In the positive cases the villi were fresh. Further evidence in support of this is seen in missed abortion, here described.

Missed Abortion.—The Friedman test is here found to be of great value. An exceptional opportunity to study the reaction in these cases was afforded by the fact that the method of choice in therapeutic abortion when indications are absolute and permanent at the Mount Sinai Hospital is radiotherapy. Following irradiation, urine specimens are examined at weekly intervals in order to determine death of fetus. The time element is not of prime importance, but the persistence of a positive reaction after a suitable interval is an indication of the necessity for further irradiation. In 7 cases, by repeated tests, it has been possible to determine the death of fetus by a negative reaction, and to predict subsequent expulsion of the dead fetal tissues. Its use as a diagnostic procedure in missed abortion due to other causes is obvious. A more detailed report of this phase of the question will appear elsewhere.

As can be seen from the results, the Friedman test is worthy of universal adoption. Although Zondek warns against its use and cites its disadvantages, attention to the details of the technic just described will give results as good as those obtained with mice. The advantages are self-evident.

145 West Eighty-sixth Street.

A METHOD FOR BIOPSY AND FOR FACILITATING INSERTION OF RADIUM IN CARCINOMA OF THE CERVIX

HYMAN STRAUSS, B.A., M.D., BROOKLYN, N. Y.

(From the Brooklyn Cancer Institute, Dr. I. I. Kaplan, Director)

HEALY has shown that cervical carcinoma in its incipiency undergoes microscopic rather than macroscopic changes, and that the only safe way to rule out carcinoma is by means of a careful biopsy. It is difficult to tell merely by the naked eye whether the erosion or nodule that we see on the cervix is a benign overgrowth of a columnar epithelium in place of the normal squamous epithelium, or whether there is the beginning of a fatal cancer. Lacerations from miscarriage or childbirth with a superimposed infection acting for a variable period of time constitute a predisposing cause for cancer in an individual who is susceptible. A simple biopsy of an erosion is harmless, and may prove or disprove the benignity of the lesion.

A simple method is as follows: Instead of using a biopsy forceps that requires moderate force to bite out a small piece and which may spread malignant cells into adjacent tissue, blood vessels, and lymphatics, a loop on a high frequency current is used. This loop cuts out a piece of tissue of any desired size, and seals as it cuts. When properly done, the specimen is not coagulated to the extent that its value for microscopic diagnosis is impaired. In fact, the line of coagulation is very thin.

Fig. 1.

A factor that may explain occasional unexpected poor result in early cases is that advanced by the late J. G. Clark of Philadelphia. He suggested that the placing of a radium applicator in the uterus might cause a pistonlike action which because of the tight fit would carry some cancer cells beyond reach. This factor may be avoided by simple dilatation of the canal before inserting the radium sound. One may question the use of a graduated dilator for this purpose, as this too may produce the pistonlike action that Clark decries. On the other hand, a dilator of the Goodell type may actually force cancer cells throughout the adjacent tissue, blood vessels, and lymphatics as the dilatation causes minute lacerations. If the cutting of tissue for biopsy is bad, forcible dilatation is worse.

To overcome the objections to the pistonlike action, and also the danger of dilatation, I have designed an endothermic loop* (Fig. 1). This loop cones out the endocervix and enables one to insert a radium tandem with ease and without the pistonlike action. By repeating the conization, the cervical canal can be made larger and larger. This overcomes all the objections mentioned heretofore, the high frequency current kills such viable cells with which it comes in contact. This loop dilates as it advances, and seals as it cuts. It should be borne in mind that the lymphatics from the cervix are just around this area.

*Made for the writer by Liebel-Florsheim Co.

The use of a cutting current in excising the endocervix did not originate with me. Hyams of New York has used this method in the treatment of endocervicitis for several years. Having been successful in treating simple endocervicitis by this method, I thought of trying this method for enlarging the canal of the cervix in cancer. The enlarged canal must extend above the internal os. The wire in the loop electrode is easily adjustable and removable, and is much more firm than that used for a simple conization. This electrode will fit into any model of a cutting current machine. This same technic will relieve a pyometra due to cervical stenosis following radium or other causes.

755 Ocean Avenue.

ATELECTASIS OF NEWBORN WITH RECOVERY FOLLOWING INTRATRACHEAL INSUFFLATION

Donald A. Bristoll, A.B., M.D., New York, N. Y.
(From the Clinic of the Woman's Hospital)

THE mother of this child was admitted to the prenatal clinic on Nov. 26, 1931. Bimonthly visits were then made to the clinic until she was confined Jan. 27, 1932. Her personal and family history were negative as were also her physical examination and laboratory findings.

The mother was delivered normally six hours after admission. The cord was not around the baby's neck and there was no fetal distress during labor.

Nitrous oxide oxygen with one-eighth of an ounce of ether was used as an anesthetic, and the total duration of anesthesia was nineteen minutes.

It was noticed immediately after delivery that the baby was deeply cyanosed. Its respirations were labored, gasping in character and irregular. Some mucus was aspirated from the child's pharynx and the Kreiselmann respirator was used, with only slight improvement in the baby's condition.

Chest examination showed a marked diminution of breath sounds anteriorly and posteriorly in the upper part of the chest and absent breath sounds at the bases. This condition continued much the same until the following morning when the attending pediatrician confirmed the previous findings and the diagnosis of atelectasis.

The prognosis was considered poor, and it was felt that the baby would die within the next twenty-four hours unless the lungs could be expanded artificially. It was decided to use the "Flagg Insufflator" for this purpose and Dr. Flagg very kindly consented to do the insufflation himself. The following is quoted from his notation on the baby's chart:

"Baby was moderately cyanosed. The chest walls moved equally on each side but there was a decided retraction of both costal margins over the epigastrium.

"The baby was laryngoscoped and the intratracheal suction tube introduced without difficulty. Suction was then practiced and carbon dioxide and oxygen given to overcome the temporary cyanosis due to intubation. The suction tube was then extracted and the intratracheal insufflation tube introduced. Intratracheal insufflation was then practiced, a pressure of 25 mm. of water being used for periods of from five to ten seconds for a duration of ten minutes. During intervals of insufflation, the respirations showed the stimulating effect of carbon dioxide and oxygen, the respirations were deep and approximately 70 times per minute. With the

temporary discontinuance of the carbon dioxide and oxygen, the respirations decreased in volume and increased in rate to 90 per minute. Accumulating saliva in the pharynx was removed by hand suction. At the end of fifteen minutes the baby was extubated and showed no signs of laryngeal irritation, such as stridor. The retraction of the costal margins seemed to have been reduced and there was an increase of one centimeter in chest expansion.''

The following morning the baby was apparently normal, a very startling relief from a most serious condition, and was discharged nine days after the intubation in good condition and with no recurrence of its respiratory difficulty.

One week after discharge the baby had gained 8 ounces and was normal in every respect. An x-ray of its chest ten weeks after discharge showed the lung fields to be clear. There was, however, a marked widening of the upper mediastinal shadow which was probably an enlarged thymus. The child showed no symptoms of thymic disease.

PYOMETRA COMPLICATING PREGNANCY

W. F. Gemmill, M.D., F.A.C.S., York, Pa.

PYOMETRA is of relatively frequent occurrence but is usually associated with cervical stenotic conditions, such as strictures or malignant infiltrations. As a complication of pregnancy it is sufficiently rare to warrant a case report.

N. B., a multipara, aged thirty-six years, was admitted to the York Hospital on April 5, 1931. She complained of pain in the lower abdomen and vomiting. Three of her children were living and well, the youngest three years of age. There was a history of one miscarriage but no curettage of the uterus had been performed, and at no time had there been any intrauterine manipulation. Her last menstrual period, lasting three days, was more than three months ago.

Two and one-half weeks before her admittance to the hospital she developed rather severe abdominal pains, occurring mostly at night and associated with a small amount of bloody discharge. These attacks of pain did not resemble labor pains or menstrual cramps but were sharp and shooting in character, simulating indigestion, and were accompanied by a feeling of faintness, nausea, and vomiting. There was no history of chills or elevation of temperature until a few days before admission at which time the temperature was 101.2° F. and the pulse was 120.

The abdomen was very tender and somewhat spastic. Bimanual examination revealed a large tender mass in the culdesac. The cervix was soft, not tender, but patulous, and would admit the index finger for 2 cm. into the canal. In the center of the lower abdomen was a tender globular mass. No definite involvement of the adnexa could be determined at this time. On account of the pelvic findings, a diagnosis of pregnancy with infection was made.

Three days later an examination demonstrated a large, tender mass in the culdesac and the uterus had become much larger, reaching almost to the umbilicus. Ten days later the mass could still be felt in the culdesac. There was no evidence of fluctuation. The corpus uteri was much larger than at the previous examination and was asymmetrical and fixed. The asymmetry was most marked on the left side and the corpus was pushed anteriorly and toward the right lateral position. On a later date it was noted that the abdominal mass was gradually enlarging and a well-marked Cullen's sign had developed.

In view of these findings it was believed that there was either a slow leakage of blood into the left broad ligament from a ruptured cornual or tubal pregnancy, or possibly a hydatidiform mole had penetrated the uterine wall and had produced an intraabdominal hemorrhage.

Roentgenologically no shadow was seen on the first plate but later plates revealed a dense shadow, smooth in outline which extended to the upper border of the fourth lumbar vertebra and laterally throughout the true pelvis. In this density there was no demonstrable shadow of the fetal skeleton.

Three examinations of the catheterized urine showed a faint trace of albumin, a few pus cells, and an occasional erythrocyte. The Wassermann test of the blood was negative and the cervical smears showed no evidence of neisserian infection.

On admission the erythrocytes were 2,050,000, white blood cells 10,600, and the hemoglobin was 45 per cent. There were 85 per cent polymorphonuclear cells and 15 per cent lymphocytes. Daily blood counts were made for ten days prior

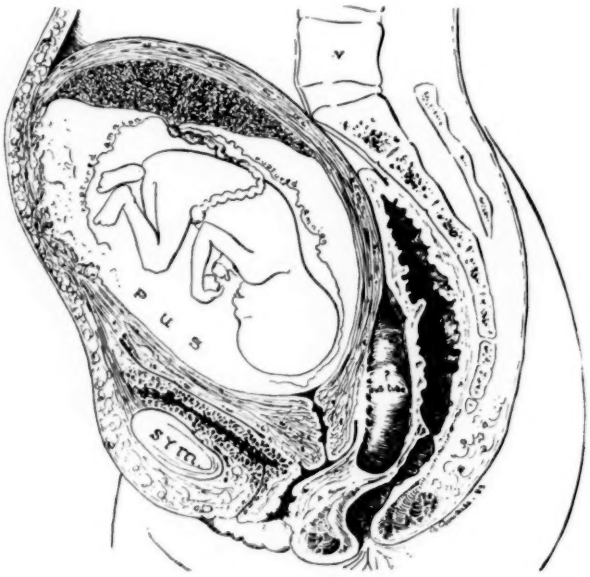

Fig. 1.—Pyometra, with fetus in utero.

to operation. The lowest erythrocytic count was on the day of admission and the lowest hemoglobin estimation was eight days after admission when it dropped to 28 per cent.

The patient was kept under observation for eighteen days and then a laparotomy was done through a subumbilical incision. The muscles and fascia were so agglutinated and edematous that the various layers could not be differentiated. The anterior surface of the uterus was adherent to the anterior parietal wall of the abdomen with a central sloughing opening through which some intrauterine contents were protruding. About 600 c.c. of pus mixed with blood flowed from the cavity of the uterus through the incision. The hand was then inserted into the uterus and a large amount of partially necrotic placental tissue, blood clots, and a well-developed fetus were removed.

Three cigaret drains and one gauze drain were inserted into the uterine cavity. The uterine musculature was coaptated by sutures above and below the drains and the abdominal wall was closed in like manner.

Macroscopically the material removed from the uterine cavity consisted of a large amount of inflammatory and necrotic placental tissue bathed in pus and a fetus, 12 cm. in length and weighing 110 grams. There was remarkably little maceration of the fetal tissues. Microscopically the tissue showed necrotic areas with round cell infiltration and pronounced acute inflammatory reaction. Pure cultures of *Staphylococcus aureus* were grown from the pus obtained at the operation. Following the drainage procedure the pulse and temperature quickly returned to normal. The abdominal wound healed rapidly and the patient was discharged on the nineteenth postoperative day.

135 East Market Street

A CASE OF UTERUS DIDELPHYS

G. R. Cheatham, M.D., Endicott, N. Y.

(From the Department of Obstetrics, Endicott Johnson Medical Service)

THIS case is submitted for publication because it offered an opportunity to study an unusual condition before, during, and after pregnancy.

F. B., aged thirty-four, white, first presented herself at the office with the chief complaint of backache. General physical examination was negative. Pelvic examination revealed a parous introitus with two longitudinal depressions separated from each other by a tonguelike septum about the consistency of a labia minora, and extending from the vulva to the area between two cervices. It was attached posteriorly but free along its anterior margin. The history subsequently explained this freedom of the anterior border. Two cervices were felt one on each side of the septum. There were two separate uteri, the right being retroverted and the left being in a normal anterior position. Inspection revealed a right cervix which showed the usual lacerations of childbirth, while the left was a nonparous cervix. Both showed moderate leucorrhea.

Her history brought out the following relevant features: Her menses were normal except that there was moderately profuse flow lasting from five to seven days with no pain, but accompanied by headache and general malaise.

Her first pregnancy ten years ago resulted in identical twins, females, which were delivered from below only after the attending physician had incised the septum separating the two vaginas. This explained the free anterior border. Prior to delivery she had not known that there was any malformation. Coitus had always been on the same side (right).

Following delivery of the twins there were innumerable self-induced abortions, with slippery elm technic, all on the right side. Coitus was only attempted once on the left side and was abandoned because of dyspareunia.

Interspersed between the abortions was one operation for ruptured appendix at which time the surgeon told the patient that she had two uteri but that her critical condition prevented thorough exploration of the pelvis.

Tampon treatments were instituted with difficulty and the patient instructed to be sure and return during a menstrual period. She was reexamined at menstruation and menstrual flow was seen to come from each cervix.

Three months later the patient was entirely free from backache and on examination the right fundus was found to be pregnant and in a normal anterior position.

The pregnancy was normal and uneventful up to six months, Nov. 10, 1932, when she developed what was apparently a perfectly normal menstrual period with flowing for four days from the nonpregnant side. The flow was seen by speculum examination to come only from the nonpregnant side, and was accompanied by the patient's usual constitutional symptoms of menstruation as headache, general malaise, etc.

On Feb. 9, 1933, the patient was delivered of an 8-pound 14-ounce living male. The labor was a normal spontaneous delivery complicated only by excessive postpartum flow.

The puerperium was uneventful except for excessive flow for the first four days.

March 21, 1933, bimanual examination showed both uteri in normal anterior position with the right uteri slightly larger than the left. Lipiodol injections showed two uteri with the right about twice the size of the left and one tube attached to the outer cornu of each uteri. Both tubes were patent.

The points of especial interest to me were the ease of delivery of a fairly large baby where one might reasonably expect obstruction or delay, and the vaginal bleeding with constitutional symptoms suggesting normal menstruation in the presence of a known pregnancy.

134 WASHINGTON AVENUE.

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Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

PATHOLOGY OF THE REPRODUCTIVE CYCLE BASED UPON OVER HALF A MILLION OBSTETRIC DELIVERIES IN DETROIT*

JAMES E. DAVIS, A.M., M.D., ANN ARBOR, MICH.

REPRODUCTION pathology may have its origin in any one of five biologic periods.

The first or premating phase of the reproduction cycle anticipates the possession of a creating complementing chain of genes which are to be the most effective biologic sublimation of life.

The selection may be mental or emotional with or without intelligent knowledge of the first principles of genetics. Intelligent selection will have scientific familiarity with the fundamental genic groupings as recognized in the body systems, constitution, qualities of mind, talents and foundations of personality, and will act in harmony with creative ideals, the supreme privilege of a creative mind.

Mating of defective genes anticipates familial pathology of prematurity, malformations, increased mortality and morbidity.

The preconception period may be lived under normal or abnormal obediences, fertility may be promoted or cheated, birth control or interruption of pregnancy practiced with due contributions to pathology.

The antenatal period challenges obstetric ability in preventive pathology, tests judgment and knowledge of physiology in pregnancy, and demands expert appreciation of deficiencies in diet and endocrines.

The natal period is the opportunity where the science and art of obstetrics meet and where one or the other too often departs. Interference may be science but too often it is art. The success of an operation may yield three percentages, one for the operation, one for the mother, and one for the child, and unless all three are a success, there is failure. There is no justification for belittling the mortality and morbidity in the child. Elective interference of present-day obstetrics is inferior to normal biologic technic.

The postnatal phase of reproduction is the physiologic bookkeeping time of the cycle when debit balances go to pathology to be carried over to the next confinement as a liability, or to later life as a malignancy.

The medical profession has established its obligations and leveled them with its ideals and it now finds itself liable to uncomfortable

*Read before the Forty-Sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Lucerne, Que., September 11 to 13, 1933.

criticism because of uncertain standards of comparison. Aggravation of the offense will continue until certain obvious corrections are made in assembling comparable statistical data, and until a more disseminated and scientific understanding of all the implications of reproduction are understood.

Analysis of Data.—Sources of material:

1. Records of the Detroit Board of Health covering the last fifteen years.

2. Hospital records for cross sectional studies for the past fifteen years, from five of Detroit's largest hospitals, averaging approximately 9,000 deliveries per year.

3. Gross and microscopic collections of the pathologic material for fifteen years from three of the above hospitals.

4. A critical review of approximately 150 leading contributions to recent obstetric and general biologic literature.

Survey of Statistics.—The statistical data reviewed is very inadequate because no uniform standard of systematization prevails. This is equally as true of national records as of local records.

Statistics.—Nativity: The city of Detroit has been characterized for its rapid growth, mixed nativity and large quota of industrially active young wage earners. In 1931 the nativity distribution, according to living births registered, was 19,996 (2,344 negroes, and 17,652 whites) native Americans, 2,212 Canadians, 1,331 British, 1,124 Polish, 916 Italians, 456 Austrians and Hungarians, 446 Russians, 372 Germans, 204 Mexicans, 152 Belgians, unclassified 1,201. The death rate under one year listed Mexicans highest and Russians lowest. The rate for Mexicans was 103.0 per 1,000 live births and that of the Russians 31.4 per 1,000 live births. The total number of living births for the year was 28,410. The total deaths under one year was 1,617 (56 per cent under one month and 43 per cent under one day). *The average rate of deaths per 1,000 births was 56.8.* (Bull. Detroit Bd. Health, 1931.)

Fifteen-Year Birth Rate Decrease (1918-1932): In 1916 Detroit's living birth rate was 33.4 per 1,000 of population. In 1932 this rate had gradually descended to 17.3 per 1,000 of population. The average living birth decrease was 2.6 per cent per year and the total decrease for fifteen years was 42.3 per cent. The average decrease of stillbirths for fifteen years was 39.1 per cent. The total number of living births for fifteen years was 444,589 and stillbirths was 20,216. Total 464,805 (living and stillbirths). The neonatal deaths decreased 30 per cent in ten years. The rate for 1931 was 31.8 per cent.

Cross-Section of Lesions in 418 Maternal Deaths from 67,096 Obstetric Deliveries.—

Hemorrhage and shock caused	30.8% of the 418 maternal deaths
Toxemia	25.8%
(with convulsions 14.6%, without 6.3%, and hyperemesis gravidarum 4.3%)	
Pulmonary lesions	24.4%
Puerperal infection and peritonitis	23.4%
Cardiac lesions	14.3%
Placental pathology	14.1%
(placenta previa 7.7%, placenta ablatio 5.5%)	
Renal pathology	11.2%
Tuberculosis	4.5%
Contracted pelvis	4.3%
Ruptured uteri	3.3%
Cerebral lesions	2.6%
Thyroid lesions	1.65%
Miscellaneous lesions (each less than 2%)	19.6%

Cross-Section of Maternal Lethal Pathology in 67,096 Deliveries.—The corrected death rate in this group was 0.532 per cent. Of the interference group 45.3 per cent died (total patients 189). Of the noninterference group 54.7 per cent died (total patients 229).

Analysis of the interference group:

Multiple operations	68.7%
Forceps	32.4
Version and extractions	32.4
Cesarean sections	23.8
Episiotomy	16.9
Induction	16.3
Breech extraction	12.6
Curettage	7.4
Craniotomy	5.3
Hysterectomy	4.7

The exclusions in the corrected group were for self-induced abortion (21), antepartum pneumonia (10), advanced tuberculosis (11), toxic goiter (5), primary anemia (4), ruptured tubal pregnancy (3), carcinoma, ruptured duodenal ulcer, cerebral hemorrhage, diabetes, epidemic meningitis, each (1).

Prenatal Care.—1. In Board of Health Clinic: In 1924 and 1925, 3,986 patients received prenatal care and instruction and were followed through the puerperium, 73.5 per cent being delivered in hospitals. Of this group 3,793 were attended by physicians and 86 by midwives and 14 were delivered by others. The comparative results show a maternal death rate for the prenatally treated group of 0.385 per cent (rate in city at large was 0.69 per cent). The neonatal death rate for the prenatally treated was 2.75 per cent (rate in city at large 4.25 per cent). The saving from prenatal care was 44 per cent for mothers, 41 per cent in babies to end of first month.

2. In Crittenton Hospital (1924 to 1932, inc.), with average residence of three to eight months: In the Crittenton Hospital group there were 8,428 deliveries with 24 maternal deaths (rate 0.284 per cent).

A group of 1,749 so-called "house cases" received institutional care, being in residence for 6.2 months, thereby providing opportunity for maximal prenatal, natal, and postnatal care which resulted in maternal mortality descending to 0.2287 per cent, notwithstanding 66 per cent of the mothers were less than twenty years of age and nearly all were primiparas. The postnatal residence positively kept mother and child together for three or more months. In two years of the above period from which the above figures were collected 31 per cent of these mothers had gonorrhea but this failed to mitigate against a low mortality.

Fetal Deaths.—In Michigan during 1932 the total death rate for babies under one year was 4,630. In this same year there were 1,372 deaths of infants certified as being due to premature births. The certified number of live births in 1932 was 85,254.

The total number of babies dying under one day was 1,318 (28.4 per cent), under one week 2,230 (48.1 per cent), and under one month 2,798 (60.4 per cent of the total death rate), *2.6 per cent of the total births.*

In Detroit (1927) deaths in infancy varied widely with the different nativities. The lowest rate was that of Russians, the rate for all causes being 46.2 (per 1,000 live births) and in early infancy 18.8. The Polish rates were highest at 92.7 (all causes) and 46.5 for early infancy. The negro rate was next highest at 91.3 (all causes) and 40.7 (in early infancy). The U. S. white rates were 67.8 and 36.9.

In 1931 the highest death rate 103.0 (under one year) was for Mexican babies and the second highest was for negroes.

In 1930 the infantile deaths under one year in Detroit numbered 2,115, a rate of 64.9 per 1,000 live births (225 of the 2,115 were colored). Of this number 481 died under one day and 1,114 died under one month. The early time of death suggests the importance of the prematurity factor. The deaths under one month comprised over 54 per cent of the total under one year. In 1930 Detroit records showed 869 infantile deaths from congenital and premature deficiencies, and for the five years ending with 1930 a significant total of *4,742*.

Within this period, or for the years 1925 and 1926, Kamperman[1] reported the records for Harper Hospital, Detroit, giving the total births in that institution as 2,478 and fetal deaths of 163, or 6.5 per cent. (Births before five months were excluded.) The deaths of babies classed as nonviables were 2.54 per cent of the total births (viability being standardized as under seven months' development and under 1,500 gm. in weight).

The deaths of viable premature babies were *0.88 per cent* of the total births. The combined death rates of nonviable and viable prematures constituted 3.42 per cent of the total birth rate or more than half of the total deaths.

In the group of babies dying at or near term there were 0.52 per cent with fatal malformations, making a combined rate of *1.40 per cent* for prematurity and malformations, or *21 per cent* of the total deaths.

In a series of 839 obstetric deliveries in 1933 (January to June) at Herman Kiefer Hospital, Detroit (city hospital), there were 90 deaths of infants, 62 being stillbirths and 28 neonatal deaths. There were no maternal deaths but 10.72 per cent of the mothers returned home without living babies. From this group of 839 deliveries there were 63 (7.51 per cent) premature live babies returned home. The premature labors represented 10.72 per cent of the total labors but from this group were derived 35.78 per cent of the total neonatal deaths and 27.42 per cent of the total stillbirths.

The deaths of premature but viable babies (weight 1,500 gm. and seven months' development) were 1.07 per cent of the entire 839 deliveries or 10 per cent of all prematures, while the rate for nonviable prematures was 0.95 per cent of the entire 839 deliveries or 8.89 per cent of the prematures. Of the two types of prematures 18.89 per cent (2.02 per cent of all deliveries) died under one month of age.

The material for satisfactory studies of causes of prematurity is inadequate, first from deficiencies in clinical records, and second from the paucity of autopsy records. In the above 839 deliveries the six most frequently named causes of prematurity were uterine retroversion, syphilis, nephritic toxemia, eclampsia, placenta previa, and uterine myomas. More than one-third of all cases are designated "unknown."

In Kamperman's series (of 2,478 births) in a private hospital (Harper), 22.7 per cent of 163 deaths are designated "unknown," 20.2 per cent from nephritic toxemia, 11.0 per cent from placental bleeding, 11 per cent from malformations, 11 per cent from delivery deaths, 6.7 per cent from labor deaths, and 3.0 per cent from prolapsed cord. The nonviable and premature babies comprised 52.2 per cent of the total deaths or 3.4 per cent of the total births.

The tragedy of major pathology in human reproduction is most clearly and emphatically set forth in large group studies. A single tragic death now and then may fail to sufficiently emphasize the need of unremitting efforts toward prevention. In the state of Michigan in 1932 there were 85,254 births. Of the infants born, 4,630 died within 1932. In other words, for every 1,000 births there were 54 infantile deaths in the year (the national rate for 1930 being 64 in 46 states). By adding the

maternal deaths of 6 per 1,000 births a total death toll of 70 per 1,000 births is obtained. To this significant toll must be added morbidity. With this there must be set up a responsibility for abortion and miscarriage deaths and morbidity not included in the 70 per 1,000 rate.

If the minimal of 5,080 infantile and maternal deaths plus an arbitrary 2,540 deaths from abortion and miscarriage be divided among approximately 11,607 registered physicians of Michigan, the ratio of 0.66 deaths per physician for the entire year of 1932 is not a striking responsibility. But *7,260 deaths in a single state* where standards of living are high and medical qualifications are good and midwife practice is small, is appalling. The loss of life is only equalled or surpassed by world calamities.

The distress of such records has been constant for thirty years. An impassê has been reached against which we have striven by increased hospitalization, increased undergraduate education, increased asepsis, increased antenatal and postnatal care, and increased elective interference without avail. Here is a stirring challenge to the membership of this and similar organizations.

A critical analysis of Detroit's statistical data, together with extended experience in diagnostic obstetric and gynecologic pathology, has provided opportunities for certain conclusions which have been neglected in the mass of literature reviewed. Chief among these are the following:

1. World as well as local obstetric statistics are in urgent need of rigid standardization to correctly set forth comparative values of obstetric procedures and biologic reproductive problems.

2. Emphasis upon undergraduate obstetric training, given in the White House Conference Report,[2] as a sine qua non to lower mortality rates, is wrong. Specialists should not be made and finished in four years of undergraduate work. The time to train specialists is in the graduate and postgraduate periods. If undergraduates are provided with 50 deliveries, there is no guarantee that experience with a single complication will occur.

After graduation, if practicing in Michigan and the total of 85,254 births could be equitably divided among our 11,607 licensed physicians, there would be only 7.3 confinements per year for each. Granting that each practitioner could have an average experience tallying with standard statistics, the following would happen in practice:

In 1932, in Michigan, there was needed a population clientele of 1,000 to supply 17.3 confinements for the entire year. One to two of these cases in the year's practice would have some degree of morbidity. Once in three years each average practitioner might elect to do or have done a cesarean section if the indications equalled those found by some obstetricians. If he chose to use forceps as frequently as is done in some of our hospitals, he could have 14 forceps applications a year. He could

do episiotomy 17 times a year. His experience with toxemia and convulsions, placenta ablatio, placenta previa, postpartum infections, etc., would be limited.

It is quite paradoxical to find that where obstetricians are highly trained, *elective operative interference has increased sufficiently to neutralize an otherwise descending maternal and infantile death rate.* The White House Conference Report tells of one Class A hospital where forceps were used 644 times in 867 deliveries, or 74.3 per cent. In Detroit in two large hospitals cesarean section deliveries varied in incidence from 1 in 203 to 1 in 32. This incidence contrast has continued for more than eight years. Operative deaths combined with complicating infections have elevated the combined maternal and fetal rates and also the morbidities. Nicholson's[3] report of 90,926 women delivered by midwives in Pennsylvania with only 77 maternal deaths and an infant mortality in the first four days of 0.02 per cent, is most astonishing. In this large group of 90,926 women, cesarean sections were done upon only 4 (incidence 1 in 22,731). A contrast of incidence between 1 in 22,731 and 1 in 32 is worthy of discussion.

In connection with hospitalization DeLee[4] has recently argued the question of certain dangers to hospitalized patients that do not obtain in deliveries at home. This paper fails to point a way for any substantial reduction in mortality rates as specialized hospitals have failed to exhibit any decided reduction in death rates.

Increased postgraduate education in obstetric and gynecologic pathology is yet much needed as an opportunity to teach that elective interference should be limited much beyond its present practice.

CONCLUSIONS

1. Deficient undergraduate education, as set forth in the White House Conference Report, is not the chief cause of high mortality and high morbidity rates.

2. The rapid increase of abortions and the widening practice of birth control are factors of great significance.

3. Postgraduate education, if effective in obstetric pathology, should be continuous for those practicing obstetrics.

4. Efficient knowledge of obstetric pathology is yet inadequate. Marked reduction of present maternal and infantile morbidity and mortality rates is certainly possible.

5. There has as yet been inadequate dissemination of fundamental knowledge concerning reproductive human biology, especially among young unmated individuals. Likewise, there has been very inadequate dissemination of antenatal and postnatal knowledge.

6. Intranatal interference as an elective procedure has prevented reduction of mortality and morbidity rates.

7. If remuneration for obstetric work were given for the quality and quantity of antenatal and postnatal services, the death and morbidity rates would promptly improve.

8. Increased elective interference has prevented hospital morbidity and mortality from descending below the present rates.

1825 GEDDES AVENUE

REFERENCES

(1) *Kamperman:* AM. J. OBST. & GYNEC. **16:** 66, 1928. (2) *Nicholson's Discussion:* Obstetric Education Sect. 1, White House Conference, pp. 44-47. The Century Co., New York. (3) *Ibid.:* pp. 44-47. (4) *DeLee and Siedentopf:* J. A. M. A. **100:** 6, 1933.

DISCUSSION

DR. A. K. PAINE, BOSTON, MASS.—Dr. Davis' paper, presented with a disquieting mathematical accuracy, offers numerous opportunities for interesting discussion; for instance, one might applaud his courage in attacking the popular and widely held present-day theory that most, if not all, our obstetric misfortunes have their origin in inadequate undergraduate instruction.

His Detroit figures furnish us with the story of 418 maternal deaths in 67,000 deliveries, and then he tells us that the Pennsylvania midwives showed but 47 maternal deaths in 90,000 deliveries. He says this is astonishing. It certainly would seem to require explaining. Next, one of his Detroit hospitals reports a cesarean incidence as high as one in thirty-two cases. The lowest incidence was one in two hundred and three cases. Then he tells us that the Pennsylvania midwives found one in 22,000 cases sufficient for their purposes. Presumably both relative rates would be changed somewhat by the often repeated alibi that the large metropolitan hospitals get all the bad cases. Presumably babies lost in delivery by these midwives, might have been saved by recourse to cesarean section. We are not enlightened concerning the degree of subsequent morbidity which must exist in this Pennsylvania group. Perhaps the patients served by the midwives of Pennsylvania are of a tougher fiber than falls to the lot of the metropolitan obstetricians. All of this may be granted to still leave, obviously, a discrepancy of rather appalling proportions.

Another set of Dr. Davis' figure centers around the Crittenton Hospital, the patients of which were mostly under twenty years of age, were primiparas, and 33 per cent were infected with gonorrhea. He intimates surprise that this apparently less favorable group showed a lower maternal death rate than could be produced by any other group in Detroit. He attributes this in part anyway to the fact of a hospital residence in the Crittenton cases which makes for close and intensive prenatal care. I am wondering if a philosophy which formerly, at least, characterized some of these Crittenton hospitals may not be playing an important part in Detroit.

The problem of illegitimacy is very largely the prevention of its repetition by the same individual. The suffering of labor in itself was by some of these controlling this work thought to act as a strong deterrent to a repetition of the experience. Regardless of the virtue of such a theory, any attempt to mitigate the pains of childbirth was avoided and operative delivery was resorted to only when an absolute obstetric indication developed; in other words, "elective interference" was not employed. I would like to ask Dr. Davis if this obtains in the Detroit hospital, and if it might not be explanatory of the good showing of that hospital?

Dr. Davis suggests that the remuneration of the obstetric specialist be based more on pregnancy and postpartum care and less on delivery service. In this remuneration aspect of obstetrics is to be found some of the explanation of the unfortunate position we find ourselves in as he compares us unfavorably with the Pennsylvania midwives. The adequately trained obstetrician is doubtless right to expect adequate remuneration, but the average patient is not going to pay it, if during her crucial hour the obstetrician lets her deliver herself, in anguish, as does the midwife. Further, she refuses to be delivered as was her grandmother, while the doctor dozed peacefully by the kitchen fire. To the patient, the present-day obstetrician has to justify himself, and his fee, first by securing a complete amnesia and second by shortening labor; he must continually be attempting to improve upon a normal process. He is not permitted to reserve his skill for the comparatively rare abnormal case, and as Dr. Davis states in his conclusions, what the highly developed obstetric specialist with his intensive study of the pathology of childbearing, and his technical skill, has gained for the patient on the one hand, he has more than lost by "elective interference" on the other.

DR. GEORGE W. KOSMAK, NEW YORK CITY.—I have been very greatly interested in this mortality problem and it has been a matter of more or less astonishment to me, that notwithstanding all that has been done in the publication of adverse obstetric results, no apparent improvement in the situation has taken place, during that period in which these results have been so widely disseminated. Dr. Davis' paper is not the first one which deals with this question. Several of our Fellows have worked along these same lines. A very noteworthy contribution was made by Adair, Mussey and Holmes some years ago. Dr. Plass also made a very important contribution to the subject and there are others, yet apparently with little effect. Is it because the profession does not read its medical journals or ever listen in over the radio? It seems to me that the only way to get at it is to bring to the local practitioner the results of the practice in his own vicinity and, if such a thing were possible, to make him ashamed to the fact that he is participating rather definitely in the production of these bad statistics. That has been done, as you know, in a number of large cities. We have completed in New York City a very careful study of the maternal mortality figures for a three-year period.* During the years 1930 to 1932, there were 1564 deaths of mothers pregnant seven months and over; 310 of these deaths following cesarean section. In other words, approximately 20 per cent of the deaths were due to this procedure. We believe there are a number of reasons for such an unfortunate state of affairs. We found, for example, that cesarean sections were done by practitioners of all types, many of whom were not qualified obstetricians.

It was found that cesarean sections were done by dermatologists, by roentgenologists, by laryngologists and by pediatricians. I think there were twelve or thirteen sections done by men who could not call themselves anything but general practioners. There were some done by general surgeons.

Now what are we going to do about it? It seems to me that our national organizations should take up specific studies, such as those made by Plass, and Adair and Mussey, by the New York, Philadelphia and other groups, and make some concerted effort to bring these not only to the attention of the profession but to the attention of the public. The public has been largely misled as to what the modern so-called obstetrician can do to alleviate the pangs of childbearing. We have been trying to make the public believe that hospitalization of maternity cases is the important thing, but has this had any favorable effect on the death rate? I think you must all admit that it has not and that we have more deaths in proportion today than when more home confinements were in vogue.

*Maternal Mortality in New York City. Commonwealth Fund. 41 East 57 Street.

Dr. Davis referred in his closing remarks in a rather slighting fashion, to midwife practice in Michigan. I feel that we have not been quite fair to the midwife, and I have been completely converted from my earlier opinions. There is a certain class of our population that can be served much better by the midwife than by the poor practitioner, or by inadequate public service.

In New York City the conditions that are prevalent in some of our public obstetric services are deplorable. Those women would be much better off at home in the care of an intelligent midwife than they would in poorly equipped hospitals. We have tried in New York City to develop an American midwife scheme. We are teaching midwifery to trained nurses, and we have done all our confinements directly in the patient's home with most excellent results. We have tried to instill into the minds of these nurse midwives that this is an elective practice, that they must only take cases that are normal or that promise to be normal after having been gone over by qualified men in our antepartum clinic. If any abnormality is noted that seems to require hospital service, that patient is referred to one of the affiliated hospitals and I believe that we must in time develop an American midwife service along this line in which intelligent women are selected for this work.

I wish to congratulate Dr. Davis on his presentation of these results. Papers like his should be brought up at every one of the meetings of this as well as other societies that are interested in this particular subject because it is only by hammering at it that we will make any impression. That impression must be made not only upon the practitioner but also upon the obstetrician, because many of these unfortunate results must be blamed on men who should know better. One of the reasons that we are getting such bad results in hospitals is that we have too much unsupervised work by the younger men, as the older and more experienced men are not consulted as often as they should be and the younger and more radically inclined junior men are allowed to have their way entirely too much.

DR. A. J. RONGY, NEW YORK CITY.—As long as the present conception of the mechanics of labor remains we are going to have a greater number of stillbirths. We must stop to think in terms of diameter of the fetal head in relation to the pelvis, think of the head as a sphere, and as long as the hemisphere is not engaged so long is labor abnormal. The thing that must be impressed upon the medical student and upon the practicing doctor is the relation of the fetal neck to the pubic arch. The further away the fetal neck is from the pubic arch, the more complicated labor and delivery will be.

DR. JAMES R. MILLER, HARTFORD, CONN.—One of the most difficult matters underlying all statistical studies in this field is that we are dealing with shifting conditions. We have not a stable population. We are having a tremendous problem with the birth rate; we are having serious difficulties with our patients in labor.

One point should be emphasized and that is that the official figures given do not mean what they apparently seem to mean. In Connecticut in 1927 we adopted the League of Nations' definition of a stillbirth and that cut our stillbirth rate over 30 per cent. We are not now counting our abortions as stillbirths.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Labor

Losell: The Prognosis for Old Primiparas, Acta Obst. et Gynec. Scandinav. **11:** 153, 1931.

This study comprises an analysis of the records of 185 primiparas, forty or more years of age, and 185 primiparas between twenty and twenty-five years and between thirty and thirty-five years. The frequency of forceps in the three groups from the youngest to the oldest was 4.3 per cent, 26 per cent, and 33.5 per cent respectively. The fetal mortality was 2.7 per cent, 9.8 per cent, and 13 per cent respectively. The prognosis was worse for breech presentations and especially when there were primary weak pains. The morbidity was only slightly higher among the older women. It is not necessary to perform a cesarean section simply because the patient is over forty years old.

J. P. GREENHILL.

Vermelin and Vaisbuch: Pregnancy After Fifty Years of Age, Rev. franç. de Gynéc. et d'obst. **26:** 12, 1931.

Gestation after fifty years of age is extremely rare. In the Nancy Maternity among 28,277 deliveries there was only one in a woman of fifty-one years of age. A pregnancy after fifty is never desired. The psychology of a woman of advanced years is peculiar. There is a mental lack of equilibrium which may end in a true psychosis or an attempt at suicide. Many of these women desire a criminal abortion.

The authors collected from the literature twenty cases of women over fifty years old who gave birth to children. There were among these, three cases of albuminuria, but no cases of vomiting, eclampsia, or toxemia of pregnancy, and none of abortion or placental hemorrhage. However, there were five instances of hydatidiform mole among the twenty cases. In many cases because of a deficient abdominal wall the uterus was markedly anteflexed, herniated and associated with abnormal fetal presentations. There were no unusual complications in the puerperium and involution was normal. The flow of milk was established without difficulty. Most of the babies were small.

J. P. GREENHILL.

Israel: Labor After a Salt Free Diet, Bull. Soc. d'obst. et de gynéc. **1:** 111, 1933.

It is the opinion of Israel that a salt-free diet during the latter months of pregnancy facilitates labor and he cites 20 cases to prove his contention. Such a diet accomplishes three things. It shortens the duration of labor, it diminishes pain especially at the beginning of labor, and it diminishes or suppresses all manifestations of spasm of the cervix, etc. The diminution of pain is due to lessened excitability of the nerve centers and the shortening of labor is a question of metabolism.

J. P. GREENHILL.

Pankow, O.: Labor in Primiparas With Normal Pelves in Whom the Fetal Head Was Floating at the Onset of Labor, Monatschr. f. Geburtsh. u. Gynäk. **90:** 33, 1932.

In a series of 1,959 primiparous labors Pankow found 260 patients or 13.6 per cent with a floating fetal head at the beginning of labor. Of this number 172 or 66 per cent had contracted pelves. Hence one-third of all primiparas in whom the fetal head is still movable above the pelvic brim at the onset of labor have normal pelves. The cause of the floating heads in these cases is lack of tonicity of the uterine musculature and defective or absent activity of the musculature during pregnancy. In support of this contention is the frequency of primary and secondary uterine inertia during labor among these women and the poor response of the uterus to oxytocics. Furthermore the necessity for the use of forceps was three times as high among these patients as ordinarily. The engagement and expulsion of the fetal head were not disturbed except for the prolongation of time. Unless these facts are appreciated, drugs will injudiciously be used to hasten labor and forceps will be applied too early with the result that damage will occur to the mother and baby. These patients should be treated in the same manner as women with contracted pelves. They belong in a hospital.

J. P. Greenhill.

Mandelstamm and Tschaikowsky: The Influence of Corpus Luteum Hormone on the Duration of Pregnancy and the Question of the Start of Labor, Zentralbl. f. Gynäk. **56:** 2346, 1932.

Twelve female white mice, far advanced in pregnancy, were injected daily with 1 c.c. of corpus luteum extracted from the ovaries of pregnant cows. The date of impregnation was known within three days. Of the 12 animals, 2 delivered within from the nineteenth to twenty-third day period of normal mouse pregnancy; 3 went four days over the longest normal time, even including the three days during which impregnation was possible. Six mice carried five days over term and 1 carried six to seven days over term. The actual duration of labor was considerably lengthened and contractions were weak.

In addition, 7 mice, pregnant at term, were given injections of from 0.5 to 1.0 c.c. corpus luteum extract and from 2.0 to 2.5 c.c. of a lipoid follicular extract. Four control animals were given folliculin alone. Labor pains were observed within from twenty-five to thirty minutes in the control animals, but were not detected during a six-hour period in the 7 test animals.

The author concludes that in the mouse, corpus luteum hormone prolongs both pregnancy and labor and is an antagonist of folliculin. Though these experiments suggest the use of corpus luteum extracts in the treatment of habitual spontaneous abortion in the human, it must be remembered that removal of corpus luteum in the human does not necessarily lead to abortion.

William F. Mengert.

Barjaktarović: Cause of the Onset of Labor, Zentralbl. f. Gynäk. **57:** 629, 1933.

Urine of laboring women was given rectally to 10 pregnant women in varying months of gestation. Six of them went into labor between one and twenty-four hours after the last injection of urine, but no woman in the first three months of pregnancy was affected in any way. Two mice and 2 rats in the second half of pregnancy likewise were precipitated into labor, though the rats threw their young two and three days after the last injection, respectively. There were no failures in this series of 4 animals. Animals injected either with ovarian or anterior pituitary hormone alone, or with urine from women in the second half of pregnancy, were not affected.

William F. Mengert.

Obstetric Analgesia and Anesthesia

McIlroy, Dame A. Louise: Analgesia and Anaesthesia in Childbirth, Canad. M. A. J. **24:** 21, 1931.

Pain during parturition should be relieved in every patient, unless it interferes with the safety of the mother and child, by analgesic and anesthetic means. Such relief lessens the danger of shock, fatigue, and lowered resistance.

For analgesia the author uses: chloral hydrate in ten to thirty grains per dose, sometimes with ten to thirty grains of potassium bromide; opiates, particularly morphine sulphate, omnopon, and opoidin in one-sixth to one-fourth grain amounts; or scopolamine $\frac{1}{150}$ to $\frac{1}{450}$ grain with morphine sulphate $\frac{1}{4}$ to $\frac{1}{6}$ grain amounts with repetition of the former as necessary. Although chloral hydrate is the safest, the opiates are very good when intelligently used.

As an anesthetic chloroform and ether are easily given. Contraindications are: for the former, toxemias, acidosis, hepatic and cardiac diseases; and for the latter, pulmonary complications. Even though nitrous oxide and ethylene can be given without interfering with the uterine contractions, the apparatus is bulky and expensive, and both are explosive. Local and spinal anesthesia require skillful administration.

H. C. Hesseltine.

McMahon, A. E.: Obstetrical Anesthesia and Analgesia in General Practice, Wisconsin M. J. **32:** 102, 1933.

Morphine or pantopon and scopolamine in small doses in the first stage, with ether or chloroform inhalations to the obstetrical degree in the second stage, constitutes a satisfactory obstetrical anesthesia in the majority of normal cases. The Gwathmey method or synergistic analgesia is practicable and satisfactory. Twilight sleep is not to be recommended for use in the home. Sodium amytal, while quite satisfactory in hospital practice, is not well adapted to home use. Spinal anesthesia is unsurpassed for forceps deliveries, episiotomy, and perineal repair, but can hardly be recommended for routine use during labor because of the frequent loss of the auxiliary forces following its employment.

J. Thornwell Witherspoon.

Claye: Hyoscine Amnesia in Labor, With or Without Chloroform, Brit. M. J. **2:** 12, 1931.

Thirty-five cases treated with the Van Hoosen dosage ($\frac{1}{100}$ grain every one-half hour for three doses and repeated every two hours thereafter until delivery), are reviewed. In 19 cases excellent results were obtained, in three good, three doubtful, and four unsatisfactory—one patient was not in labor.

One patient was quite violent and many were restless, although many were also quiet throughout. To obtain perfect amnesia the last injection just before delivery must not be omitted. No asphyxiated babies were delivered. One was drowsy for the first few days, although normal respiration started promptly.

These patients had constant watching in a quiet darkened room. The excellent results of the amnesia are worth the effort. A pulse rise (early in labor) to about 120, thirst, and some trouble with vision due to poor accommodation for twenty-four hours after delivery, were the only other effects noted besides restlessness. The bladder needs especial watching.

F. L. Adair and A. B. Hunt.

Morimoto, H.: Relation Between the Action of Morphine on the Rabbit Uterus in Situ and the Suprarenal Capsule, Jap. J. Obst. & Gynec. **15:** 437, 1932.

The accelerating effect of morphine on the uterus of a normal rabbit could not be detected after the suprarenal capsules were removed or both visceral nerves were incised. Hence the accelerating action of morphine on the rabbit uterus has a close connection with the secretion of adrenalin from the suprarenal capsules and perhaps the action of morphine may be central.

J. P. GREENHILL.

Jaroschka: Demonstration of Pernocton in the Maternal Body, and in the Placenta, Zentralbl. f. Gynäk. **55:** 470, 1931.

Many babies born after pernocton has been used for obstetric analgesia are somnolent and difficult to resuscitate, though the color and the heart tones are good. The author has the impression that the respiratory center has been interfered with. Two fetal deaths were observed which, in the absence of any demonstrable cause of death at postmortem, must be blamed on pernocton. Following injection of 5 c.c. of pernocton intravenously in the parturient woman, a substance was recovered from the maternal urine which resembled barbituric acid in the melting point, but was negative for the mercuric nitrate test for veronal. Biologically, this recovered substance induced sleep in white mice one minute after injection. The respirations of the animals were irregular and weak, and these conditions lasted about twenty minutes. Extracts of the placenta gave a weak reaction for barbituric acid. (Kobes and Rupp have demonstrated bromine and barbituric acid in fetal urine.) The author concludes that pernocton is not without danger.

WILLIAM F. MENGERT.

Bohler, E.: Clinical Experiences With Pernocton as an Anesthetic in Obstetrics, Bull. Soc. d'obst. et. de gynéc. **1:** 68, 1932.

Bohler used pernocton to produce anesthesia in 102 obstetric patients. The drug was always administered intravenously and in most cases 5 c.c. were given. The effect of the drug is extremely rapid, changes being noted even after the injection of 1 c.c. The patient interrupts her conversation, she becomes quiet, begins to yawn, her eyes close and she falls asleep. There is very little effect on the uterine contractions. However, during the period of expulsion, there was a decrease in the uterine contractions in ten cases. Small doses of pituitary extract restored uterine activity in these cases.

In about five-sixths of the primiparas the babies were born within fifty-eight minutes after pernocton was administered. All the multiparas except three had their babies within twenty minutes. In no case was forceps applied.

The results in this series were almost ideal. Of the 102 patients 72 did not recall anything about labor. In 17 cases there was partial amnesia but from the point of view of anesthesia the results were good. In 9 cases there was partial amnesia and anesthesia and in only 4 cases was there a complete failure.

All but three of the newborn infants cried immediately after birth. These three babies were narcotized but all the children left the hospital alive.

The disadvantages of pernocton anesthesia are as follows: (1) In about one-fourth of the cases there is a stage of excitation and in some instances there is marked violence. Hence patients under the effect of pernocton must be closely watched and this means an increased personnel in an institution. (2) The anesthesia lasts only from two and a half to three hours. To overcome this some authors add scopolamine and others give an intramuscular injection of pernocton when the effect of the intravenous injection begins to wear off.

J. P. GREENHILL.

Olson and Van Ess: Pernocton in Obstetrics, Wisconsin M. J. 32: 459, 1933.

Pernocton is suitable for intravenous administration because of its solubility and because of the absence of deleterious effects on mother and child. It has a distinct advantage over the other barbiturates because of the replacement of one hydrogen atom by the bromal radical. One cubic centimeter per 12½ kilograms should serve only as the approximate dosage. In the primipara morphine sulphate should precede the pernocton injection. The solution may be given in the primipara when the cervix is 3 or 4 cm. dilated and the pains are of good intensity. Not more than 1 c.c. should be given during an interval of 2 minutes. Amnesia ranges from two to four hours. Sloughing at the site of injection has not been noted. There was no maternal or fetal death in this series. The tendency to produce excitation was the only unsatisfactory finding.

J. T. WITHERSPOON.

Boucek and Renton: Experimental Studies of the Effect of Amytal Upon the Fetus and its Transmission Through the Placenta of the White Rat, Surg. Gynec. Obst. 52: 884, 1931.

From the experiment on 27 white rats the following conclusions are made: (1) The amount of sodium amytal necessary to anesthetize a pregnant rat does not in any way interfere with the viability of the fetus; the fetus is not anesthetized and readily responds to gross stimulation. (2) Sodium amytal quickly passes from the maternal into the fetal circulation. (3) In calculating the amount of sodium amytal necessary to anesthetize a pregnant animal, the weight of the fetuses must be subtracted from the weight of the mother. (4) The anesthetic value of sodium amytal may be enhanced when supplemented with small quantities of ether.

WM. C. HENSKE.

Kulka, E.: Lumbar Anesthesia in Obstetric Operations, Med. Klin. 29: 354, 1933.

The value of lumbar anesthesia in obstetrics is still an unsettled question. Kulka has employed this form of anesthesia for the interruption of pregnancy up to the seventh month without any mishaps. From the fourth to the seventh months the operations consisted of vaginal cesarean sections. In a series of 37 patients there was only one death (due to pulmonary tuberculosis). The author also used lumbar anesthesia in 9 cases of abdominal cesarean section. In eight cases the results were satisfactory except for one case of pneumonia. After the injection, the uterus contracted strongly so that the babies had to be extracted rapidly to avoid asphyxia. In one case, however, the patient collapsed three minutes after the injection. She recovered after artificial respiration and intracardial injection of adrenalin.

J. P. GREENHILL.

Gonnet: Four Cases of Extemporaneous Evacuation of the Uterus Under Spinal Anesthesia, Bull. Soc. d'obst. et de gynéc. 2: 124, 1930.

The author reports four cases where delivery was accomplished by means of manual dilatation of the cervix under spinal anesthesia. One patient was a multipara, the only case where dilatation was completely effected. According to Gonnet the results of this procedure are very inconstant, and it should be employed for strict indications only. Cases which are unsuitable are those where labor has been prolonged, where the uterus is contracted and the cervix is resistant. In such cases it is better to perform a vaginal hysterotomy.

J. P. GREENHILL.

De Peretti: A Few Cases Where Regional Anesthesia Was Used in the Rapid Emptying of the Uterus From Below, Bull. Soc. d'obst. et de gynéc. **1:** 27, 1931.

The author reports 18 cases in which he employed regional anesthesia to accomplish rapid delivery through the vagina. All the patients were seriously ill and their gestations varied from two to eight and a half months. Nine women had pulmonary tuberculosis, five had serious cardiac disease and two had eclampsia. Epidural anesthesia was employed and in all the cases, the operations performed were rendered easy. There was complete anesthesia and paralysis of the vagina, the vulva, and sometimes the cervix. In all but three cases vaginal cesarean section was performed. There was very little shock connected with the operations, and it seemed as if the epidural anesthesia provoked strong uterine retraction which prevented postoperative hemorrhage.

J. P. Greenhill.

Miscellaneous

Neuman, R.: Endometrial and Myometrial Transplants into the Anterior Chamber of the Eye, Arch. f. Gynäk. **150:** 224, 1932.

The author transplanted bits of endometrium and myometrium into the anterior chambers of 55 rabbits. The transplants grow readily and changes can be observed easily. Following each transplant there results an inflammatory reaction of the conjunctiva, the iris and the uveal tract. Such reactions begin on the second day, increase until the seventh or tenth day and persist for thirty to forty days. Corneal scars and destruction of the eye rarely occur. Following the recession of the postoperative inflammatory reactions, the transplants are considered successful only if they have maintained their normal size and are rose-red in color. They are considered negative if they have shrunken and are grey-white. If the same blood groups are used, there is apparently no difference between homo- and autotransplants. The negative transplants are slowly but steadily absorbed, occasionally with cyst formation.

The positives show definite changes during estrus and during pregnancy. The reddening accompanying estrus increases for twenty-four hours, maintains its maximum for twenty-four hours, and fades out in twenty-four hours. During pregnancy, the transplants undergo a definite hypertrophy, become edematous and loosen. This is followed by an active arterial hyperemia and finally, just before delivery, a venous hypertrophy sets in. The transplants become normal within forty-eight hours after the uterus is emptied.

Injections of progynon or of urine from pregnant women always result in estrus-like reactions. These begin within thirty-six minutes after injection, attain their maximum in an average of fifty-four minutes, and last about one hour. Four hours later the transplant is again normal in appearance. Repeated progynon injections result in cyst formations in the transplants.

Ralph A. Reis.

Bland, Wenrich, and Goldstein: Trichomonas Vaginitis in Pregnancy, Surg. Gynec. Obst. **53:** 759, 1931.

In the present study the parasite was found in 136 or 22.7 per cent of 600 gravid women. In none of the cases studied has the organism been found within the cervical canal. From this study it appears that the intestine is not the source of Trichomonas vaginalis.

Only 18 (13.2 per cent) of the patients with trichomoniasis complained of irritating symptoms, although practically all had an abnormal vaginal secretion.

One seems justified in concluding that Trichomonas vaginalis is pathogenic in that it may provoke a purulent discharge, characterized by a creamy yellow acid and frothy or foamy nature, and occasionally a hemorrhagic or granular type of vaginitis.

The effect of vaginal trichomoniasis on puerperal morbidity was studied in 250 patients. The morbidity rate for both white and colored patients who harbored the infection prior to delivery was found considerably higher than in those free of the parasite. This would seem to indicate that Trichomonas may play a part etiologically in puerperal morbidity.

Finally, gravid women with frank trichomonad infection should be treated and rendered, if possible, parasite-free during the antenatal period.

WM. C. HENSKE.

Item

American Board of Obstetrics and Gynecology

Written examination for Group B. candidates will be held in various cities of the United States and Canada, April 7: *Oral* and *General* examination for all candidates in Cleveland, June 12, immediately prior to meeting of the American Medical Association. Reduced railroad rates will be available and all applicants are urged to register in the Section and attend the scientific sessions.

A dinner and round table conference will be held at the Hotel Cleveland, Cleveland, on the first day of the scientific session of the American Medical Association, Wednesday, June 13, at seven o'clock. All Diplomates are requested to be present and physicians interested in obstetrics and gynecology are invited to attend. New Diplomates granted certificates at the examination held immediately preceding the American Medical Association Convention will be introduced individually.

For further information and application blanks for these examinations apply to the Secretary, Dr. Paul Titus, 1015 Highland Building, Pittsburgh (6), Pa.

Erratum

In the article by Dr. Arthur J. Wallingford in the February issue of the Journal on page 230, the legends to the figures are reversed. Fig. 6 should read Fig. 5, and Fig. 5 should read Fig. 6.